



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IX

75 Hawthorne Street
San Francisco, Ca. 94105-3901

Received DOE
Grand Jct. Proj. Office

DEC 27 1991

December 23, 1991

MEMORANDUM

SUBJECT: Post Removal Soil Data, Bluewater Uranium Mine Sites

FROM: Robert Bornstein *RB*
Federal On-Scene-Coordinator

TO: Bluewater Interagency Committee

Enclosed for your review are the post removal soil sampling data collected at the Bluewater Uranium Mine Sites. During the week of September 15, 1991, ten composite samples were collected from the Bluewater Uranium Mine Sites. The composite samples were analyzed for Uranium isotopes and Radium 226 at the USEPA National Air and Radiation Environmental Lab located in Montgomery, Alabama.

BROWN-VANDEVER-NANABAH: Section 24, T13N, R11W

In order to collect the composite samples, the reclaimed zone was subdivided into three areas: BV24A, BV24B, BV24C. Using a 45'X 50' grid (total 45 samples per section), samplers collected five tablespoon surface samples along the grid and placed them into a mixing bucket. After completing the sampling, the bucket was thoroughly mixed and a composite sample of one kilogram was collected and transferred into a zip lock bag. A background composite sample, BV24D, was collected by selecting 45 random samples from undisturbed portions of Section 24. See figure A.

BROWN-VANDEVER: Section 18, T13N, R10W

Two samples were collected within Section 18. A total of 45 samples were collected within the reclaimed area. These samples were well mixed and a 1 Kg composite sample was drawn (BV18A). In addition, a random composite background sample was collected along the perimeter of the reclaimed area in undisturbed areas (BV18B). See figure B.

DESIDERIO MINE SITE: Section 26, T 13N, R 10W

The Desiderio Mine Site area was subdivided into three equal sections. A 45'X 100' grid (total of 45 samples per section) was used to collect five tablespoon surface samples. The samples

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were placed into a mixing bucket and a 1 Kg composite sample was withdrawn. A random composite background sample was collected from non-disturbed areas around Section 26. See figure C.

DISCUSSION

The soil sampling data reveals that the reclamation action has successfully reduced any potential surface radiological hazard at these sites. The data shows that background conditions within the mine sites are not significantly lower than those detected within the reclaimed areas. No sample exceeded the regulatory standard of 5 pCi/g over background pursuant to 40 CFR Section 192.

In general, the Radium 226 levels recorded within the reclaimed zones are not uncommon to the natural Radium 226 concentrations detected within the Grants Mining District. Background Radium 226 concentrations in Milan, New Mexico (approximately 15 miles SE of the sites) have been reported by the Office of Radiation Programs⁽¹⁾ to be as high as 6.2 pCi/g. Background concentrations of Radium 226 of 2.2 pCi/g and 3.3 pCi/g were detected outside of San Mateo, New Mexico and within unmined areas of Ambrosia Lake.

Attached for your review is a copy of the Risk Assessment data generated by Steve Dean, Office of Air and Radiation, using sample BV24A. This sample was selected since it recorded the highest uranium and radium 226 content. The Assessment took into account all four possible pathways from soil exposure; ingestion, particulate inhalation, volatiles, and external gamma. The exposure scenario of eight (8) hours per day, 50 weeks per year for one year was used. Based on this scenario and a sample concentration of total uranium at 7.0 pCi/g and Radium 226 at 3.7 pCi/g (these samples include their respective background); the combined total risk from both metals for this sample is 3.0 in 10 million (3.0×10^{-7}). Using a Superfund residence scenario of thirty years, the total risk factor is 9 in 1 million excess cancer risk (9.0×10^{-6}).

Overall, the risk factor for the other samples are well below these figures. This risk calculation is a worst case scenario using the highest sample data. Risk associated with the natural conditions documented in the OAR Report⁽¹⁾ are also within the same risk factor or greater than those calculated for the BV24A sample. EPA uses the 10^{-6} risk value as a "point of departure" when selecting clean-up levels for National Priorities List Sites (40 CFR Section 300.430).

¹ "Report of Ambient Outdoor Radon and Indoor Radon Progeny Concentrations During November 1975 At Selected Locations in the Grants Mineral Belt, New Mexico," Office of Radiation Programs, Las Vegas, NV., June 1976, Report # OAR/LV-76-4: USDC NTIS PB-258-257.

CONCLUSIONS

In conclusion, the reclamation action undertaken by EPA has significantly reduced the radiological hazards associated with the mining wastes at the Bluewater Uranium Mine Sites. Both gamma radiation and radionuclide concentrations at the sites have been reduced to "natural" or background conditions. As documented in the OAR report referenced above, it is not uncommon to find natural Radium 226 readings higher within the Grants Mining District than those detected within our samples. The EPA response team to Bluewater believes that these sites no longer pose any immediate health hazard to the local public or wildlife. As a safeguard, further radiological testing and monitoring should be performed prior to any residential structures being constructed on the Sites.

If you have any questions or concerns, please contact me at 415-744-2298 (FTS 484-2298).



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IX

75 Hawthorne Street
San Francisco, Ca. 94105-3901

December 20, 1991

MEMORANDUM

SUBJECT: Bluewater Uranium Mine Site Soil Samples Data

FROM: Steve M. Dean *SUDEAN*
Environmental Scientist, (A-1-1)

TO: Robert Bornstein
Environmental Scientist, (H-8-3)

Listed below are the total uranium and radium 226 results for the 10 composite soil samples collected from the Bluewater Uranium Mine Site. The values listed are in picoCuries per gram (pCi/g) for dry weight of soil:

<u>SAMPLE ID</u>	<u>Total Uranium</u>	<u>Radium 226</u>
BV24A	7.0	3.7
BV24B	3.6	3.2
BV24C	3.2	2.9
BV24D (Background)	0.55/0.64*	0.73/0.90*
BV18A	1.5	0.94
BV18B (Background)	0.97	0.93
DES1	2.9	1.8
DES2	3.5	3.6
DES3	2.3	1.7
DES4 (Background)	2.2	2.4

* Analysed twice as a duplicate sample.

Since Sample BV24A was the highest in uranium and radium 226, I used its concentrations to perform a soil exposure risk assessment using Superfund's Risk Assessment Guidance, Human Health Evaluation Manual Part B. This assessment took into account all four possible pathways from soil exposure; ingestion, particulate inhalation, volatiles, and external gamma. I also used an exposure scenario of 8 hours per day, 50 weeks per year for one year. Based on the above concentrations and this scenario, the total risk for uranium is 1.6

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in 10 million and total risk for radium 226 is 1.4 in 10 million. Combined total risk from both metals at this location, (BV24A), is 3.0 in 10 million.

I hope this information is useful to you, if you have any questions or need any further assistance please contact me at X4-1049. Thank you.

Attachments

cc: Mike Bandrowski, (A-1-1)

RADIONUCLIDE RISK ASSESSMENT
in CONTAMINATED SOIL

RADIONUCLIDE OF CONCERN? ~~u234~~ **SAMPLE BU24 A.**
ENTER THE INGESTION SLOPE FACTOR? 1.4E-10
NOW ENTER THE INHALATION SLOPE FACTOR? 2.7E-8
ENTER THE EXTERNAL EXPOSURE SLOPE FACTOR? 5.7E-14
ENTER RADIONUCLIDE CONCENTRATION (in pCi/gram)? 3.385
NUMBER OF HOURS PER DAY OF EXPOSURE? 8
ENTER NUMBER OF WEEKS PER YEAR OF EXPOSURE? 50
ENTER NUMBER OF YEARS OF EXPOSURE? 1
INGESTION RISK = 4.730863E-12
VOLATILE RISK = 1.892345E-27
PARTICULATES RISK = 3.639125E-14
EXTERNAL EXPOSURE RISK = 1.804036E-08
TOTAL RISK = 1.804513E-08

PRESS S FOR RECALCULATING THE SAME RADIONUCLIDE?

1LIST 2RUN 3LOAD" 4SAVE" 5CONT 6,"LPT1 7TRON 8TROFF 9KEY 0SCREEN

RADIONUCLIDE RISK ASSESSMENT
in CONTAMINATED SOIL

RADIONUCLIDE OF CONCERN? U235 **SAMPLE BV24A.**
ENTER THE INGESTION SLOPE FACTOR? $1.3\text{E}-10$
NOW ENTER THE INHALATION SLOPE FACTOR? $2.5\text{E}-8$
ENTER THE EXTERNAL EXPOSURE SLOPE FACTOR? $9.6\text{E}-12$
ENTER RADIONUCLIDE CONCENTRATION (in pCi/gram)? .1388
NUMBER OF HOURS PER DAY OF EXPOSURE? 8
ENTER NUMBER OF WEEKS PER YEAR OF EXPOSURE? 50
ENTER NUMBER OF YEARS OF EXPOSURE? 1
INGESTION RISK = $3.267138\text{E}-11$
VOLATILE RISK = $1.306855\text{E}-26$
PARTICULATES RISK = $2.513183\text{E}-13$
EXTERNAL EXPOSURE RISK = $1.245869\text{E}-07$
TOTAL RISK = $1.246198\text{E}-07$

PRESS S FOR RECALCULATING THE SAME RADIONUCLIDE?

1LIST 2RUN 3LOAD" 4SAVE" 5CONT 6,"LPT1 7TRON 8TROFF 9KEY 0SCREEN

RADIONUCLIDE RISK ASSESSMENT
in CONTAMINATED SOIL

RADIONUCLIDE OF CONCERN? U238
ENTER THE INGESTION SLOPE FACTOR? $1.3\text{E}-10$
NOW ENTER THE INHALATION SLOPE FACTOR? $2.4\text{E}-8$
ENTER THE EXTERNAL EXPOSURE SLOPE FACTOR? $4.6\text{E}-14$
ENTER RADIONUCLIDE CONCENTRATION (in pCi/gram)? 3.524
NUMBER OF HOURS PER DAY OF EXPOSURE? 8
ENTER NUMBER OF WEEKS PER YEAR OF EXPOSURE? 50
ENTER NUMBER OF YEARS OF EXPOSURE? 1
INGESTION RISK = $3.974666\text{E}-12$
VOLATILE RISK = $1.589866\text{E}-27$
PARTICULATES RISK = $3.057435\text{E}-14$
EXTERNAL EXPOSURE RISK = $1.515672\text{E}-08$
TOTAL RISK = $1.516073\text{E}-08$

SAMPLE BV24 A.

PRESS S FOR RECALCULATING THE SAME RADIONUCLIDE?

1LIST 2RUN 3LOAD" 4SAVE" 5CONT 6,"LPT1 7TRON 8TROFF 9KEY 0SCREEN

RADIONUCLIDE RISK ASSESSMENT
in CONTAMINATED SOIL

RADIONUCLIDE OF CONCERN? RA226

SAMPLE BV24A.

ENTER THE INGESTION SLOPE FACTOR? $1.2e-10$ NOW ENTER THE INHALATION SLOPE FACTOR? $3e-9$ ENTER THE EXTERNAL EXPOSURE SLOPE FACTOR? $4.2e-13$

ENTER RADIONUCLIDE CONCENTRATION (in pCi/gram)? 3.7

NUMBER OF HOURS PER DAY OF EXPOSURE? 8

ENTER NUMBER OF WEEKS PER YEAR OF EXPOSURE? 50

ENTER NUMBER OF YEARS OF EXPOSURE? 1

INGESTION RISK = $3.810288E-11$ VOLATILE RISK = $1.524116E-26$ PARTICULATES RISK = $2.930991E-13$ EXTERNAL EXPOSURE RISK = $1.45299E-07$ TOTAL RISK = $1.453374E-07$

PRESS S FOR RECALCULATING THE SAME RADIONUCLIDE?

1LIST 2RUN 3LOAD" 4SAVE" 5CONT 6,"LPT1 7TRON 8TROFF 9KEY 0SCREEN

12/11/1991 14:22 USEPA NAREL MONT. ALA.

228 3454 P.02

*** MANUAL Uranium Calculations from Program Asu ***

This listing was created 12/03/91 at 08:25 by CRIKNG.

Sample Id: R9A 91.07507

BU24A

Counting system	AS 1 - Shelf A	Prep Date	11/26/91
Date, Time counted	11/27/91 14:05	Bkg Date	11/22/91
Type Analysis	U prep by AS	Eff Date	12/19/90
Length of count	1000.0 Min	Std Date	10/09/91
Detector efficiency	0.213		
Sample size	0.5201 GASH		
Factor # 1	0.9370 GWET		
Factor # 2	0.9820 GDRY		

Gross cnts: Isotope	Bkg	PCI/GASH	MDA	2 Sigma error in % Absolute
U-234	884.	6.	3.447E+00	5.535E-02 11.34% 3.909E-01
U-235	36.	0.	1.413E-01	1.064E-02 34.55% 4.883E-02
U-238	917.	3.	3.588E+00	4.226E-02 11.25% 4.035E-01

TOTAL U 7.2

Gross cnts: Isotope	Bkg	PCI/GWET	MDA	2 Sigma error in % Absolute
U-234	884.	6.	3.230E+00	5.535E-02 11.34% 3.662E-01
U-235	36.	0.	1.324E-01	1.064E-02 34.55% 4.575E-02
U-238	917.	3.	3.362E+00	4.226E-02 11.25% 3.781E-01

TOTAL U 6.7

Gross cnts: Isotope	Bkg	PCI/GDRY	MDA	2 Sigma error in % Absolute
U-234	884.	6.	3.385E+00	5.535E-02 11.34% 3.838E-01
U-235	36.	0.	1.388E-01	1.064E-02 34.55% 4.795E-02
U-238	917.	3.	3.524E+00	4.226E-02 11.25% 3.963E-01

TOTAL U 7.0

 ***** Recalculated and Written To Database *****

12/11/1991 14:23 USEPA NAREL MONT. ALA.

228 3454 P.03

*** MANUAL Uranium Calculations from Program Asu ***

This listing was created 12/03/91 at 08:26 by CRIKNG.

Sample Id: R95 91.07508

BV248

Counting system AS 2 - Shelf A
 Date, Time counted 11/27/91 14:05
 Type Analysis U Prep by AS
 Length of count 1000.0 Min
 Detector efficiency 0.206
 Sample size 0.5025 GASH
 Factor # 1 0.9430 GWET
 Factor # 2 0.9540 GDRY

Prep Date 11/26/91
 Bkg Date 11/22/91
 Eff Date 12/19/90
 Std Date 10/09/91

Gross cnts: Isotope	Bkg	PCI/GASH	MDA	2 Sigma error in %	Absolute
U-234 424.	5.	1.879E+00	5.878E-02	13.63%	2.560E-01
U-235 17.	1.	7.175E-02	3.300E-02	53.86%	3.864E-02
U-238 406.	4.	1.803E+00	5.385E-02	13.76%	2.481E-01
TOTAL 3.8					

Gross cnts: Isotope	Bkg	PCI/GWET	MDA	2 Sigma error in %	Absolute
U-234 424.	5.	1.772E+00	5.878E-02	13.63%	2.414E-01
U-235 17.	1.	6.766E-02	3.300E-02	53.86%	3.644E-02
U-238 406.	4.	1.700E+00	5.385E-02	13.76%	2.340E-01
TOTAL 3.5					

Gross cnts: Isotope	Bkg	PCI/GDRY	MDA	2 Sigma error in %	Absolute
U-234 424.	5.	1.792E+00	5.878E-02	13.63%	2.443E-01
U-235 17.	1.	6.845E-02	3.300E-02	53.86%	3.686E-02
U-238 406.	4.	1.720E+00	5.385E-02	13.76%	2.367E-01
TOTAL 3.6					

 ***** Recalculated and Written To Database *****

12/11/1991 14:23 USEPA NAREL MONT. ALA.

228 3454 P.04

... Uranium Calculations from Program Asu ***

This listing was created 12/04/91 at 07:46 by CRIKNG.

Sample Id: R98 91.07509 BV24c

Counting system	AS 1 - Shelf A	Prep Date	11/26/91
Date, Time counted	12/02/91 14:05	Bkg Date	11/22/91
Type Analysis	U Prep by AS	Eff Date	12/19/90
Length of count	1000.0 Min	Std Date	10/09/91
Detector efficiency	0.213		
Sample size	0.5170 GASH		
Factor # 1	0.9558 GWET		
Factor # 2	0.9880 GDRY		

Gross cnts: Isotope	Bkg	PCI/GASH	MDA	2 Sigma error in % Absolute
U-234	375.	5.	1.566E+00	5.549E-02 14.01% 2.194E-01
U-235	19.	0.	8.043E-02	1.147E-02 46.80% 3.764E-02
U-238	375.	2.	1.579E+00	3.931E-02 13.92% 2.197E-01

TOTAL U 3.2

Gross cnts: Isotope	Bkg	PCI/GWET	MDA	2 Sigma error in % Absolute
U-234	375.	5.	1.497E+00	5.549E-02 14.01% 2.097E-01
U-235	19.	0.	7.688E-02	1.147E-02 46.80% 3.598E-02
U-238	375.	2.	1.509E+00	3.931E-02 13.92% 2.100E-01

TOTAL U 3.1

Gross cnts: Isotope	Bkg	PCI/GDRY	MDA	2 Sigma error in % Absolute
U-234	375.	5.	1.547E+00	5.549E-02 14.01% 2.168E-01
U-235	19.	0.	7.947E-02	1.147E-02 46.80% 3.719E-02
U-238	375.	2.	1.560E+00	3.931E-02 13.92% 2.171E-01

TOTAL U 3.2

 ***** Recalculated and Written To Database *****

12/11/1991 14:24 USEPA NAREL MONT. ALA.

228 3454 P.05

*** MANUAL Uranium Calculations from Program Asu ***

This listing was created 12/03/91 at 08:29 by CRKNG.

Sample Id: R98 91.07510

B124D

Counting system AS 4 - Shelf A
 Date, Time counted 11/27/91 14:05
 Type Analysis U prep by AS
 Length of count 1000.0 Min
 Detector efficiency 0.236
 Sample size 0.5073 GASH
 Factor # 1 0.9560 GWET
 Factor # 2 0.9800 GDRY

Prep Date 11/26/91
 Bkg Date 11/22/91
 Eff Date 12/19/90
 Std Date 10/09/91

DVIAS

gross cnts: Isotope	Bkg	PCI/GASH	MDA	2 Sigma error in % Absolute
U-234 94.	20.	2.834E-01	9.001E-02	30.15%
U-235 3.	2.	3.830E-03	3.556E-02	447.30%
U-238 71.	0.	2.719E-01	1.038E-02	25.29%
TOTAL U 0.56				

gross cnts: Isotope	Bkg	PCI/GWET	MDA	2 Sigma error in % Absolute
U-234 94.	20.	2.709E-01	9.001E-02	30.15%
U-235 3.	2.	3.661E-03	3.556E-02	447.30%
U-238 71.	0.	2.599E-01	1.038E-02	25.29%
TOTAL U 0.53				

gross cnts: Isotope	Bkg	PCI/GDRY	MDA	2 Sigma error in % Absolute
U-234 94.	20.	2.777E-01	9.001E-02	30.15%
U-235 3.	2.	3.753E-03	3.556E-02	447.30%
U-238 71.	0.	2.665E-01	1.038E-02	25.29%
TOTAL U 0.55				

 Recalculated and Written To Database

12/11/1991 14:24 USEPA NAREL MONT. ALA.

228 3454 P.06

*** ANNUAL Uranium Calculations from Program ASU ***

This listing was created 12/03/91 at 08:29 by CRIKNG.

Sample Id: R9S 91.07510X

BV24D

Counting system AS 5 - Shelf A
 Date, Time counted 11/27/91 14:05
 Type Analysis U prep by AS
 Length of count 1000.0 Min
 Detector efficiency 0.206
 Sample size 0.5094 GASH
 Factor # 1 0.9560 GWET
 Factor # 2 0.9800 GDRY

Prep Date 11/26/91
 Bkg Date 11/22/91
 Eff Date 12/19/90
 Std Date 10/09/91

Gross cnts:	Isotope	Bkg	PCI/GASH	MDA	2 Sigma error in %	Absolute
U-234	62.	7.	2.460E-01	6.714E-02	31.64%	7.781E-02
U-235	1.	0.	4.472E-03	1.212E-02	200.22%	8.954E-03
U-238	91.	1.	4.025E-01	3.291E-02	23.30%	9.377E-02
TOTAL U			0.65			

Gross cnts:	Isotope	Bkg	PCI/GWET	MDA	2 Sigma error in %	Absolute
U-234	62.	7.	2.351E-01	6.714E-02	31.64%	7.439E-02
U-235	1.	0.	4.275E-03	1.212E-02	200.22%	8.560E-03
U-238	91.	1.	3.848E-01	3.291E-02	23.30%	8.964E-02
TOTAL U			0.62			

Gross cnts:	Isotope	Bkg	PCI/GDRY	MDA	2 Sigma error in %	Absolute
U-234	62.	7.	2.410E-01	6.714E-02	31.64%	7.626E-02
U-235	1.	0.	4.383E-03	1.212E-02	200.22%	8.775E-03
U-238	91.	1.	3.944E-01	3.291E-02	23.30%	9.189E-02
TOTAL U			0.64			

 Recalculated and Written To Database

12/11/1991 14:25 USEPA NAREL MONT. ALA.

228 3454 P.07

*** MANUAL Uranium Calculations from Program Asu ***

This listing was created 12/04/91 at 07:47 by CRIKNG.

Sample Id: R9S 91.07511 **BY18A**

Counting system	AS 2 - Shelf A	Prep Date	11/26/91
Date, Time counted	12/02/91 14:05	Bkg Date	11/22/91
Type Analysis	U prep by AS	Eff Date	12/19/90
Length of count	1000.0 Min	Std Date	10/09/91
Detector efficiency	0.206		
Sample size	0.5130 GASH		
Factor # 1	0.9730 GWET		
Factor # 2	0.9958 GDRY		

Gross cnts: Isotope	Bkg	PCI/GASH	MDA	2 Sigma error in %	Absolute
U-234 180.	4.	7.534E-01			
U-235 13.	0.	5.565E-02	5.141E-02	18.01%	1.357E-01
U-238 158.	3.	6.635E-01	1.160E-02	56.25%	3.130E-02
			4.608E-02	18.84%	1.250E-01
TOTAL U 1.5					

Gross cnts: Isotope	Bkg	PCI/GWET	MDA	2 Sigma error in %	Absolute
U-234 180.	4.	7.330E-01			
U-235 13.	0.	5.414E-02	5.141E-02	18.01%	1.320E-01
U-238 158.	3.	6.456E-01	1.160E-02	56.25%	3.046E-02
			4.608E-02	18.84%	1.216E-01
TOTAL U 1.4					

Gross cnts: Isotope	Bkg	PCI/GDRY	MDA	2 Sigma error in %	Absolute
U-234 180.	4.	7.502E-01			
U-235 13.	0.	5.541E-02	5.141E-02	18.01%	1.351E-01
U-238 158.	3.	6.607E-01	1.160E-02	56.25%	3.117E-02
			4.608E-02	18.84%	1.245E-01
TOTAL U 1.5					

 Recalculated and Written To Database

12/11/1991 14:26 USEPA NAREL MONT. ALA.

228 3454 P.08

*** MANUAL Uranium Calculations from Program Asu ***

This listing was created 12/03/91 at 08:30 by CRIKNG.

Sample Id: R98 91.07512 **BV18B**

Counting system	AS 7 - Shelf A	Prep Date	11/26/91
Date, Time counted	11/27/91 14:05	Bkg Date	11/22/91
Type Analysis	U prep by AS	Eff Date	12/19/90
Length of count	1000.0 Min	Std Date	10/09/91
Detector efficiency	0.211		
Sample size	0.5064 GASH		
Factor # 1	0.9540 GWET		
Factor # 2	0.9840 GDRY		

Gross cnts:	Isotope	Bkg	PCI/GASH	MDA	2 Sigma error in %	Absolute
U-234	113.	5.	5.042E-01	6.119E-02	22.22%	1.120E-01
U-235	2.	2.	0.000E+00 = <MDA	4.335E-02	0.00%	1.867E-02
U-238	104.	1.	4.808E-01	3.436E-02	22.02%	1.059E-01
TOTALU			0.98			

Gross cnts:	Isotope	Bkg	PCI/GWET	MDA	2 Sigma error in %	Absolute
U-234	113.	5.	4.810E-01	6.119E-02	22.22%	1.069E-01
U-235	2.	2.	0.000E+00 = <MDA	4.335E-02	0.00%	1.781E-02
U-238	104.	1.	4.587E-01	3.436E-02	22.02%	1.010E-01
TOTALU			0.94			

Gross cnts:	Isotope	Bkg	PCI/GDRY	MDA	2 Sigma error in %	Absolute
U-234	113.	5.	4.961E-01	6.119E-02	22.22%	1.102E-01
U-235	2.	2.	0.000E+00 = <MDA	4.335E-02	0.00%	1.837E-02
U-238	104.	1.	4.731E-01	3.436E-02	22.02%	1.042E-01
TOTALU			0.97			

 ***** Recalculated and Written To Database *****

12/11/1991 14:26 USEPA NAREL MONT. ALA.

228 3454 P.09

This listing was created 12/04/91 at 12:56 by CHIKNG.

Sample Id: R9S 91.07513 **DES1**

Counting system AS 3 - Shelf A
 Date, Time counted 12/02/91 14:05
 Type Analysis U Prep by AS
 Length of count 1000.0 Min
 Detector efficiency 0.251
 Sample size 0.5073 GASH
 Factor # 1 0.8890 GWET
 Factor # 2 0.9074 GDRY

Prep Date 11/26/91
 Bkg Date 11/22/91
 Eff Date 12/19/90
 Std Date 10/09/91

Gross cnts: Isotope	Bkg	PCI/GASH	MDA	2 Sigma error in %	Absolute
U-234	406.	9.	1.578E+00	6.622E-02	13.44%
U-235	17.	2.	5.963E-02	3.691E-02	58.76%
U-238	386.	0.	1.534E+00	1.077E-02	13.38%
TOTAL			3.2		

Gross cnts: Isotope	Bkg	PCI/GWET	MDA	2 Sigma error in %	Absolute
U-234	406.	9.	1.403E+00	6.622E-02	13.44%
U-235	17.	2.	5.301E-02	3.691E-02	58.76%
U-238	386.	0.	1.364E+00	1.077E-02	13.38%
TOTAL			2.8		

Gross cnts: Isotope	Bkg	PCI/GDRY	MDA	2 Sigma error in %	Absolute
U-234	406.	9.	1.432E+00	6.622E-02	13.44%
U-235	17.	2.	5.410E-02	3.691E-02	58.76%
U-238	386.	0.	1.392E+00	1.077E-02	13.38%
TOTAL			2.9		

 ***** Recalculated and written To Database *****

12/11/1991 14:27 USEPA NAREL MONT. ALA.

228 3454 P.10

*** MANUAL Uranium Calculations from Program ASU ***

This listing was created 12/03/91 at 08:22 by CRIKNG.

Sample Id:

R9S 91.07514

DES2

Counting system AS 8 - Shelf A
 Date, Time counted 11/29/91 12:33
 Type Analysis U prep by AS
 Length of count 1000.0 Min
 Detector efficiency 0.208
 Sample size 0.5000 GASH
 Factor # 1 0.9669 GWET
 Factor # 2 0.9871 GDRY

Prep Date 11/26/91
 Bkg Date 11/22/91
 Eff Date 12/19/90
 Std Date 10/09/91

Gross cnts: Isotope Bkg PCI/GASH
 U-234 396. 9. 1.683E+00
 U-235 34. 0. 1.479E-01
 U-238 388. 3. 1.675E+00

TOTAL 3.5

MDA 2 Sigma error
 in % Absolute
 7.246E-02 13.94% 2.346E-01
 1.179E-02 35.53% 5.254E-02
 4.682E-02 13.84% 2.317E-01

Gross cnts: Isotope Bkg PCI/GWET
 U-234 396. 9. 1.628E+00
 U-235 34. 0. 1.430E-01
 U-238 388. 3. 1.619E+00

TOTAL 3.4

MDA 2 Sigma error
 in % Absolute
 7.246E-02 13.94% 2.268E-01
 1.179E-02 35.53% 5.081E-02
 4.682E-02 13.84% 2.241E-01

Gross cnts: Isotope Bkg PCI/GDRY
 U-234 396. 9. 1.662E+00
 U-235 34. 0. 1.460E-01
 U-238 388. 3. 1.653E+00

TOTAL 3.5

MDA 2 Sigma error
 in % Absolute
 7.246E-02 13.94% 2.315E-01
 1.179E-02 35.53% 5.187E-02
 4.682E-02 13.84% 2.288E-01

 Recalculated and Written To Database

12/11/1991 14:27 USEPA NAREL MONT. ALA.

228 3454 P.11

*** Gamma Calculations from Program Asu ***

This listing was created 12/04/91 at 07:49 by CRIKNG.

Sample Id: R9S 91.07515 **DES3**

Counting system AS 4 - Shelf A
 Date, Time counted 12/02/91 14:05
 Type Analysis U prep by AS
 Length of count 1000.0 Min
 Detector efficiency 0.236
 Sample size 0.5012 GASH
 Factor # 1 0.6123 GWET
 Factor # 2 0.9800 GDRY

Prep Date 11/26/91
 Bkg Date 11/22/91
 Eff Date 12/19/90
 Std Date 10/09/91

Gross cnts:	Isotope	Bkg	PCI/GASH	MDA	2 Sigma error in %	Absolute
U-234	229.	7.	1.210E+00	8.184E-02	16.83%	2.036E-01
U-235	11.	4.	3.816E-02	6.547E-02	111.07%	4.238E-02
U-238	202.	2.	1.090E+00	5.062E-02	17.19%	1.874E-01
TOTAL U 2.3						

Gross cnts:	Isotope	Bkg	PCI/GWET	MDA	2 Sigma error in %	Absolute
U-234	229.	7.	7.410E-01	8.184E-02	16.83%	1.247E-01
U-235	11.	4.	2.336E-02	6.547E-02	111.07%	2.595E-02
U-238	202.	2.	6.675E-01	5.062E-02	17.19%	1.148E-01
TOTAL U 1.4						

Gross cnts:	Isotope	Bkg	PCI/GDRY	MDA	2 Sigma error in %	Absolute
U-234	229.	7.	1.186E+00	8.184E-02	16.83%	1.995E-01
U-235	11.	4.	3.739E-02	6.547E-02	111.07%	4.153E-02
U-238	202.	2.	1.068E+00	5.062E-02	17.19%	1.837E-01
TOTAL U 2.3						

 ***** Recalculated and Written To Database *****

12/11/1991 14:28 USEPA NAREL MONT. ALA.
THIS LISTING WAS CREATED 12/03/91 AT 08:23 BY CHKNG.

228 3454 P.12

Sample Id: R9S 91.07516 **D6S4**

Counting system	AS 9 - Shelf A	Prep Date	11/26/91
Date, Time counted	11/29/91 12:33	Bkg Date	11/22/91
Type Analysis	U prep by AS	Eff Date	12/19/90
Length of count	1000.0 Min	Std Date	10/09/91
Detector efficiency	0.213		
Sample size	0.5043 GASH		
Factor # 1	0.9469 GWET		
Factor # 2	0.9642 GDRY		

Gross cnts:	Isotope	Rkd	PCI/GASH	MDA	2 Sigma error in %	Absolute
U-234	307.	7.	1.137E+00	5.665E-02	14.81%	1.676E-01
U-235	19.	0.	7.169E-02	1.023E-02	46.74%	3.351E-02
U-238	303.	3.	1.132E+00	4.062E-02	14.69%	1.663E-01
TOTAL U 2.3						

Gross cnts:	Isotope	Rkd	PCI/GWET	MDA	2 Sigma error in %	Absolute
U-234	307.	7.	1.072E+00	5.665E-02	14.81%	1.587E-01
U-235	19.	0.	6.769E-02	1.023E-02	46.74%	3.173E-02
U-238	303.	3.	1.072E+00	4.062E-02	14.69%	1.574E-01
TOTAL U 2.2						

Gross cnts:	Isotope	Rkd	PCI/GDRY	MDA	2 Sigma error in %	Absolute
U-234	307.	7.	1.091E+00	5.665E-02	14.81%	1.616E-01
U-235	19.	0.	6.913E-02	1.023E-02	46.74%	3.231E-02
U-238	303.	3.	1.091E+00	4.062E-02	14.69%	1.603E-01
TOTAL U 2.2						

***** Recalculated and written To Database *****

Sample ID R95 91.07507
Sample type SOIL
Collection date, time 9/19/91 0:00
Location NM:PREWITT
Other ID's BV24A
Comments BLUEWATER U MINE SITES

Type of analysis ***** RA226 *****
NUCLIDE ACTIVITY 2 SIG ERROR UNITS DATE
RA-226 3.7700E+00 2.20 % PCI/GASH 9/19/91
RA-226 3.5300E+00 2.20 % PCI/GWET 9/19/91
RA-226 3.7000E+00 2.20 % PCI/GDRY 9/19/91

Sample ID R95 91.07508
Sample type SOIL
Collection date, time 9/19/91 0:00
Location NM:PREWITT
Other ID's BV24B
Comments BLUEWATER U MINING SITES

Type of analysis ***** RA226 *****
NUCLIDE ACTIVITY 2 SIG ERROR UNITS DATE
RA-226 3.2600E+00 2.36 % PCI/GASH 9/19/91
RA-226 3.0700E+00 2.36 % PCI/GWET 9/19/91
RA-226 3.2200E+00 2.36 % PCI/GDRY 9/19/91

Sample ID R95 91.07509
Sample type SOIL
Collection date, time 9/19/91 0:00
Location NM:PREWITT
Other ID's BV24C
Comments BLUEWATER U MINING SITES

Type of analysis ***** RA226 *****
NUCLIDE ACTIVITY 2 SIG ERROR UNITS DATE
RA-226 2.9500E+00 2.49 % PCI/GASH 9/19/91
RA-226 2.8200E+00 2.49 % PCI/GWET 9/19/91
RA-226 2.9100E+00 2.49 % PCI/GDRY 9/19/91

12/18/1991 12:27 USEPA NAREL MONT. ALA.

228 3454 P.03

Sample ID R95 91.07510
Sample type SOIL
Collection date, time 9/19/91 0:00
Location NM:PREWITT
Other ID's BV24D
Comments BLUEWATER MINING U SITES

Type of analysis ***** RA226 *****
NUCLIDE ACTIVITY 2 SIG ERROR UNITS DATE
RA-226 7.5000E-01 4.93 % PCI/GASH 9/19/91
RA-226 7.2000E-01 4.93 % PCI/GWET 9/19/91
RA-226 7.3000E-01 4.93 % PCI/GDRY 9/19/91

Sample ID R95 91.07510X
Sample type SOIL
Collection date, time 9/19/91 0:00
Location NM:PREWITT
Other ID's BV24D
Comments BLUEWATER MINING U SITES

Type of analysis ***** RA226 *****
NUCLIDE ACTIVITY 2 SIG ERROR UNITS DATE
RA-226 9.2000E-01 4.57 % PCI/GASH 9/19/91
RA-226 8.8000E-01 4.57 % PCI/GWET 9/19/91
RA-226 9.0000E-01 4.57 % PCI/GDRY 9/19/91

Sample ID R95 91.07511
Sample type SOIL
Collection date, time 9/19/91 0:00
Location NM:PREWITT
Other ID's BV18A
Comments BLUEWATER U MINING SITES

Type of analysis ***** RA226 *****
NUCLIDE ACTIVITY 2 SIG ERROR UNITS DATE
RA-226 9.5000E-01 4.60 % PCI/GASH 9/19/91
RA-226 9.2000E-01 4.60 % PCI/GWET 9/19/91
RA-226 9.4000E-01 4.60 % PCI/GDRY 9/19/91

12/18/1991 12:28 USEPA NAREL MONT. ALA.

228 3454 P.04

Sample ID R9S 91.07512
Sample type SOIL
Collection date, time 9/19/91 0:00
Location NM:PREWITT
Other ID's BV:8B
Comments BLUEWATER U MINING SITES

Type of analysis ***** RA226 *****
NUCLIDE ACTIVITY 2 SIG ERROR UNITS DATE
RA-226 9.4000E-01 4.45 % PCI/GASH 9/19/91
RA-226 9.0000E-01 4.45 % PCI/GWET 9/19/91
RA-226 9.3000E-01 4.45 % PCI/GDRY 9/19/91

Sample ID R9S 91.07513
Sample type SOIL
Collection date, time 9/19/91 0:00
Location NM:PREWITT
Other ID's DES1
Comments BLUEWATER U MINING SITES
Report to GERRY LUSTER

Type of analysis ***** RA226 *****
NUCLIDE ACTIVITY 2 SIG ERROR UNITS DATE
RA-226 2.0000E+00 3.21 % PCI/GASH 9/19/91
RA-226 1.7800E+00 3.21 % PCI/GWET 9/19/91
RA-226 1.8100E+00 3.21 % PCI/GDRY 9/19/91

Sample ID R9S 91.07514
Sample type SOIL
Collection date, time 9/19/91 0:00

Location NM:PREWITT
Other ID's DES2
Comments BLUEWATER U MINING SITES

Type of analysis ***** RA226 *****
NUCLIDE ACTIVITY 2 SIG ERROR UNITS DATE
RA-226 3.6600E+00 2.26 % PCI/GASH 9/19/91
RA-226 3.5300E+00 2.26 % PCI/GWET 9/19/91
RA-226 3.6100E+00 2.26 % PCI/GDRY 9/19/91

12/18/1991 12:29 USEPA NAREL MONT. ALA.

228 3454 P.05

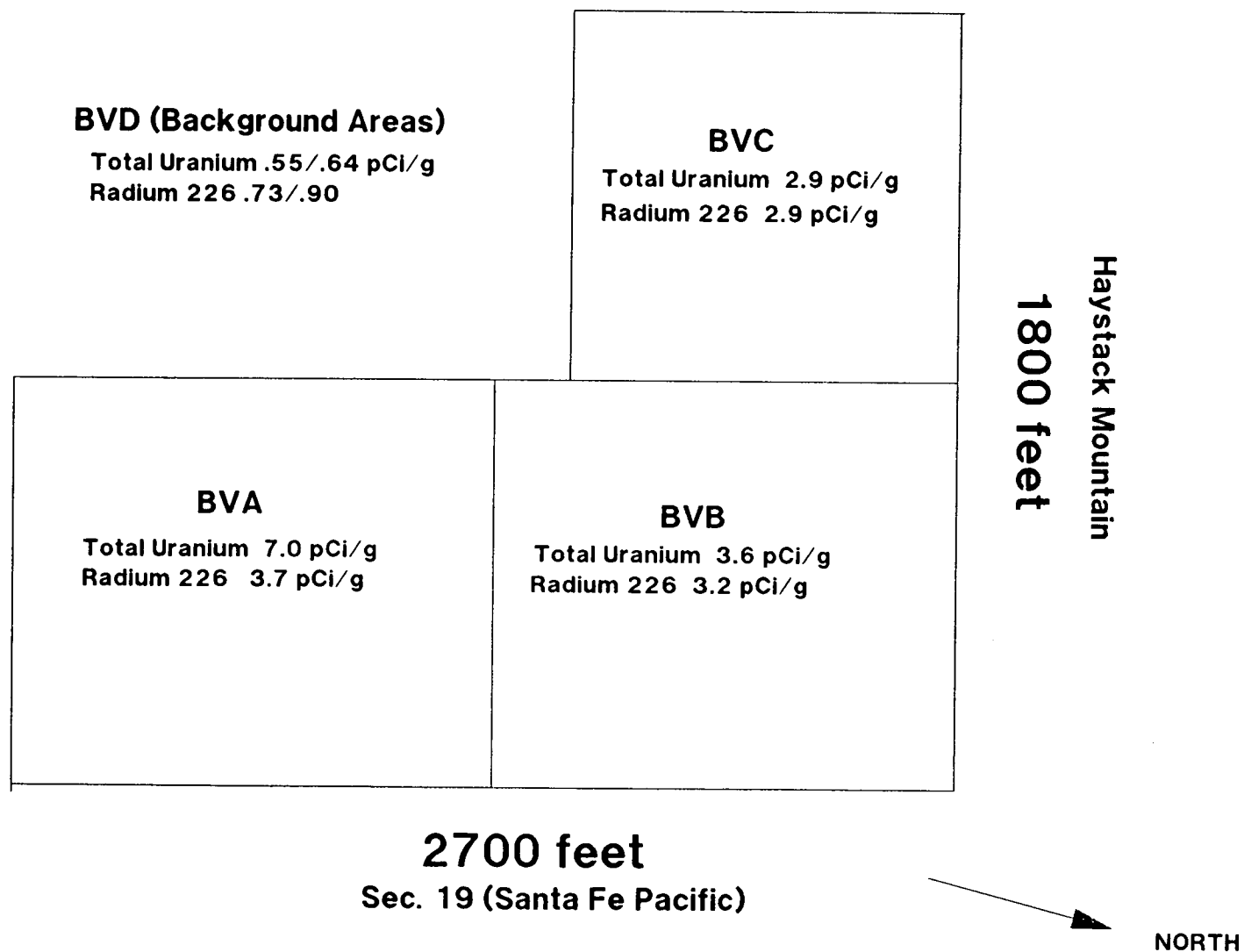
Sample ID R98 91.07515
Sample type SOIL
Collection date, time 9/18/91 0:00
Location NM:PREWITT
Other ID's DES3
Comments BLUEWATER U MINING SITES

Type of analysis ***** RA226 *****
NUCLIDE ACTIVITY 2 SIG ERROR UNITS DATE
RA-226 1.8000E+00 3.38 % PCI/GASH 9/19/91
RA-226 1.1000E+00 3.38 % PCI/GWET 9/19/91
RA-226 1.7600E+00 3.38 % PCI/GDRY 9/19/91

Sample ID R98 91.07516
Sample type SOIL
Collection date, time 9/18/91 0:00
Location NM:PREWITT
Other ID's DES4
Comments BLUEWATER U MINING SITES

Type of analysis ***** RA226 *****
NUCLIDE ACTIVITY 2 SIG ERROR UNITS DATE
RA-226 2.4700E+00 2.71 % PCI/GASH 9/19/91
RA-226 2.3400E+00 2.71 % PCI/GWET 9/19/91
RA-226 2.3800E+00 2.71 % PCI/GDRY 9/19/91

POST REMOVAL URANIUM/RADIUM SOIL SAMPLING BROWN-VANDEVER SEC. 24, T13N, R11W

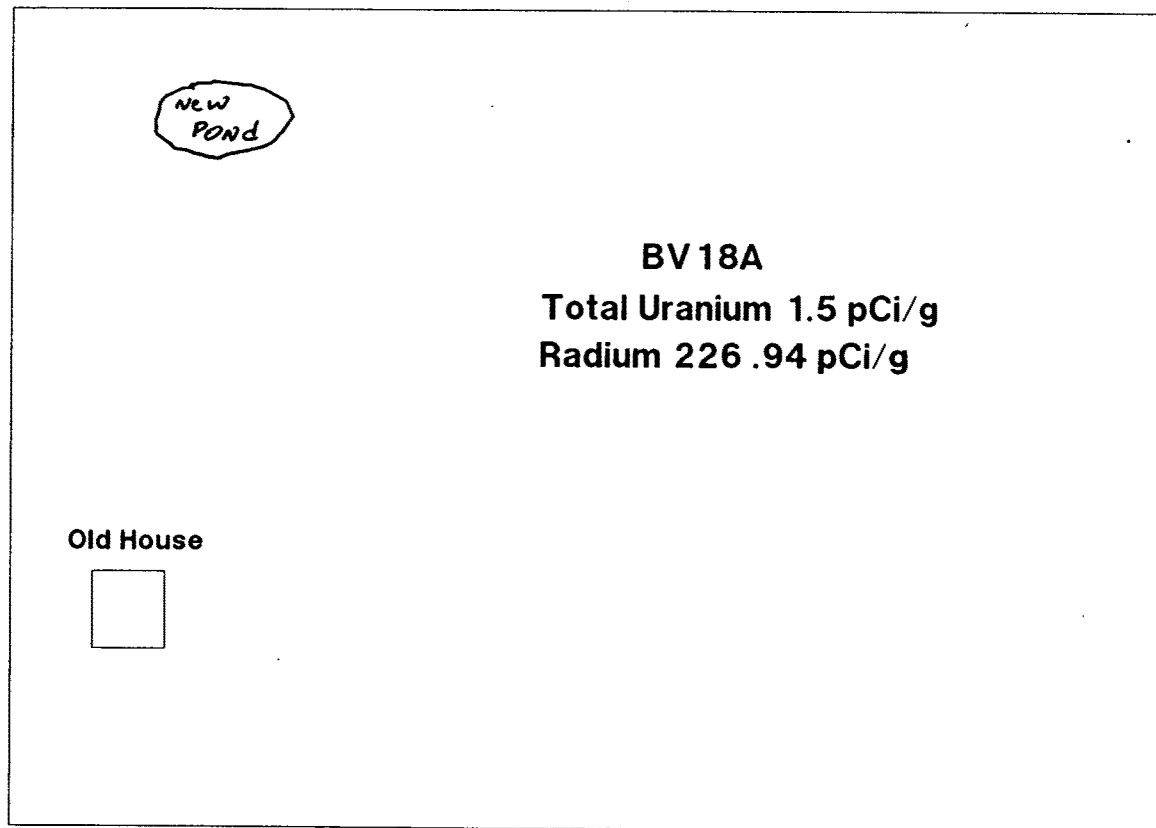


Not to Scale
Figure A

POST REMOVAL URANIUM/RADIUM SOIL SAMPLING BROWN-VANDEVER SEC. 18, T 13N, R 10W

Haystack Mountain
BV 18B (BACKGROUND)
Total Uranium .97 pCi/g
Radium 226 .93 pCi/g

North



Not To Scale
Figure B

POST REMOVAL URANIUM/RADIUM SOIL SAMPLING DESIDERIO MINE SITE

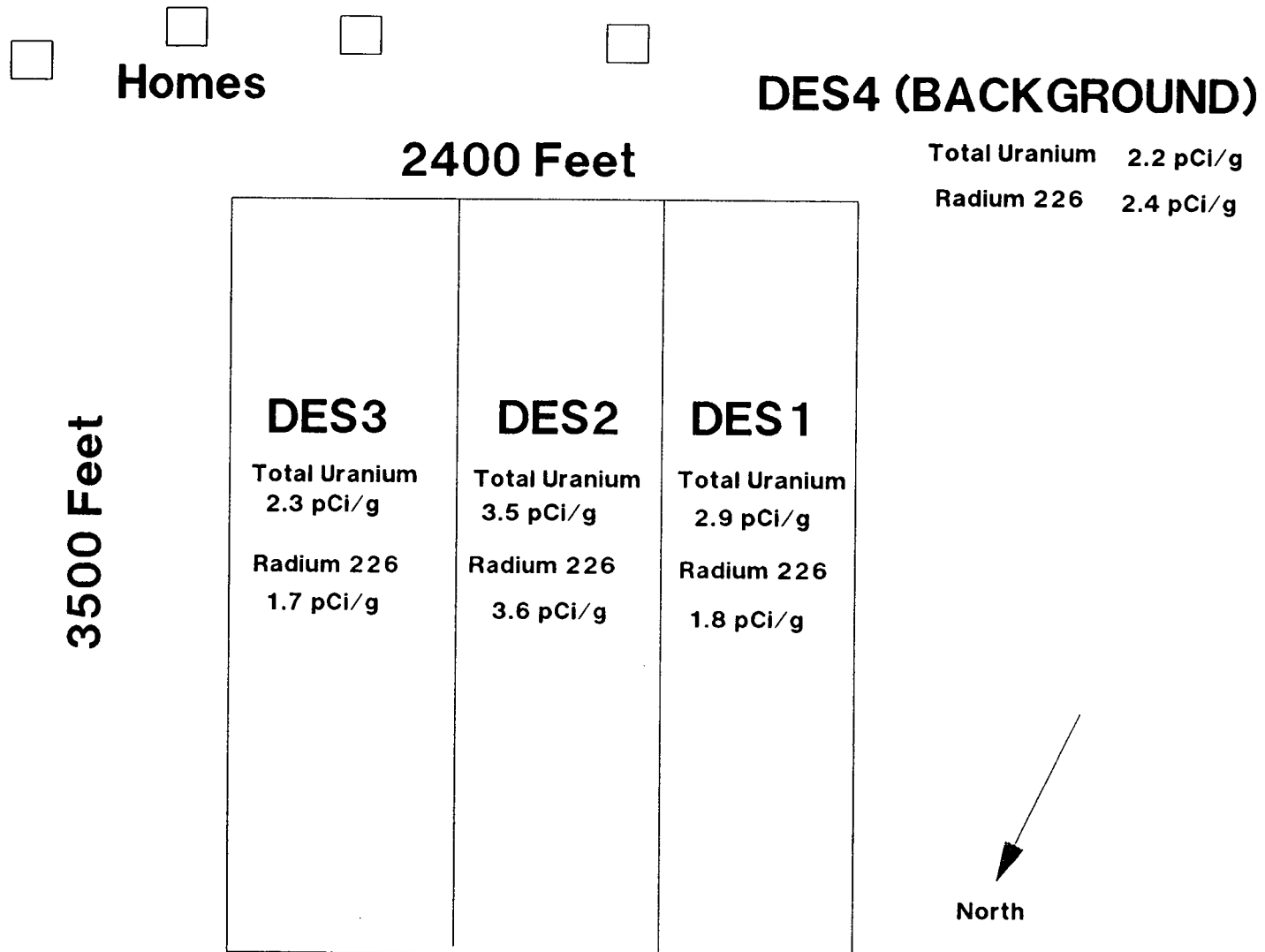


Figure C
NOT TO SCALE

Received DOE
Grand Jct. Proj. Office

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DEC 06 1991

REGION IX

75 Hawthorne Street
San Francisco, Ca. 94105-3901

02 DEC 1991

Certified Mail No. P887 519 183
RETURN RECEIPT REQUESTED

Mr. George R. Wagner
President, Cerrillos Land Company
6200 Uptown Blvd., N.E.
Albuquerque, NM 87110

RE: Completion of Obligations under EPA Order 91-16

Dear Mr. Wagner:

The United States Environmental Protection Agency (EPA) has received and reviewed your Post Response Report pursuant to EPA Order 91-16. The data within the response report reveal that the response action was successful in reducing the elevated gamma radiation levels to levels consistent with those specified in the Order.

With the completion and submittal of the Post Response Report, Cerrillos Land Company has successfully completed its obligations under EPA Order 91-16. The EPA thanks you for your cooperation and effort in complying with the Order. If you have any questions or concerns, please contact Mr. Robert Bornstein of my staff at 415-744-2298.

Sincerely,

Jeff Zelikson, Director
Hazardous Waste Management Division

cc: Tim Leftwitch, Santa Fe Pacific Minerals
Linda Wandres, ORC
Robert Bornstein, OSC
Joanne Manygoats, Navajo Nation
Ray Churan, DOI

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IX

75 Hawthorne Street
San Francisco, Ca. 94105-3901

December 18, 1991
Madeline Roanhorse
Acting Director
Navajo Abandoned Mine Land Program
P.O. Box 1875
Window Rock, AZ 86515

via mail and fax
602-871-7595

RE: Multi Agency Meeting to Address Uranium Mine Sites, Navajo Nation.

Dear Ms. Roanhorse:

As I discussed during our telephone conversation on December 18, 1991, the Environmental Protection Agency (EPA) and the Navajo Superfund Office have been working together in trying to develop strategy in addressing abandoned uranium mine sites on the Navajo Nation. During the summer of 1991, the EPA assisted by the Navajo Superfund Office, conducted response and reclamation activities at the Brown-Vandever, Brown-Nanabah, and Navajo Desiderio Mine sites located near Haystack Mountain, Prewitt, New Mexico (see enclosed report). With the success of this response action, EPA and the Navajo Superfund program would like to coordinate activities with the Office of Surface Mining and the Navajo Abandoned Mine Land Program to evaluate and address other mine sites on the Navajo Nation.

Enclosed for your review and comments is a strategy proposed by EPA and supported by the Navajo Superfund Program to address these numerous sites (attached schematic). The proposed process is:

- A) The Navajo Superfund Program (NSP) personnel through the EPA PA/SI grant continue to conduct preliminary assessments and site investigations on uranium mine sites;
- B) The NSP and Navajo Abandoned Mine Land Program (NAML) work together and prioritize sites;

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C) Sites ELIGIBLE to be addressed by the Surface Mine Reclamation Control Act of 1977, as amended, will:

- 1) Be addressed with SMCRA funds by the NAML and the NSP will assist with clean-up goals and monitoring;

OR

- 2) Sites where mining firms are active on Navajo Lands, the NSP will approach firms and try to negotiate clean-up operations (THE PRIVATE PARTY INITIATIVE). NSP staff will provide oversight on clean-up operations.

The NSP with the assistance of the NAML will try to draft mine law regulations stating that firms that have not been responsible in conducting reclamation actions will not receive future mining leases on the Navajo Nation. If private firms fail to clean-up sites, NAML will conduct actions under SMCRA authority.

D) Sites INELIGIBLE for SMCRA will be referred to the EPA for:

- 1) EPA Removal Assessment and/or
- 2) Hazard Ranking Evaluation (National Priority Listing)

Sites not eligible for EPA removal actions or NPL listing will be referred back to the NSP for Enforcement Actions.

This mechanism will be developed using the EPA Superfund Core Grant to establish a Navajo Nation Comprehensive Environmental Response Law.

Key Points

- * The Navajo Nation Comprehensive Environmental Response Law will develop a fund for the NSP to use to enforce local hazardous substance regulations and power to initiate clean-up actions and pursue cost recovery.
- * Potential funding -- local tax on mining, oil, gas, timber and chemical industries.

EPA and the Department of the Interior have been discussing this strategy. I have personally been in communication with Ronald Sassaman and Jerry White of the Office of Surface Mining concerning this proposed strategy. The Department of the Interior, Office of Environmental Affairs is planning a meeting to discuss this strategy and to develop a common understanding among the various Federal and Navajo Nation agencies. This meeting is scheduled for January 22, 1992 and will be held at the Department of the Interior Office located in Room 1431A, 517 Gold Avenue,

SW., Albuquerque, New Mexico. The Office of Environmental Affairs has written a meeting agenda and I have attached a copy for your review. During the first session of meetings, EPA and representatives of the various Department of the Interior Bureaus and Offices will try to work on formalizing a united Federal position. In the afternoon, representatives of the Navajo Superfund and Navajo Abandoned Mine Land Program are scheduled to address their concerns and join the proceedings. Together, I hope this proposed scheme will be accepted and implemented. I feel strongly that a united NAML and NSP working together could address nearly all of the abandoned uranium mine sites on the Navajo Nation which pose significant environmental hazards.

If you have any questions or concerns, please contact me at 415-744-2298. I look forward to talking with you and hopefully meeting you in Albuquerque. Thank you for your time and cooperation on this matter.

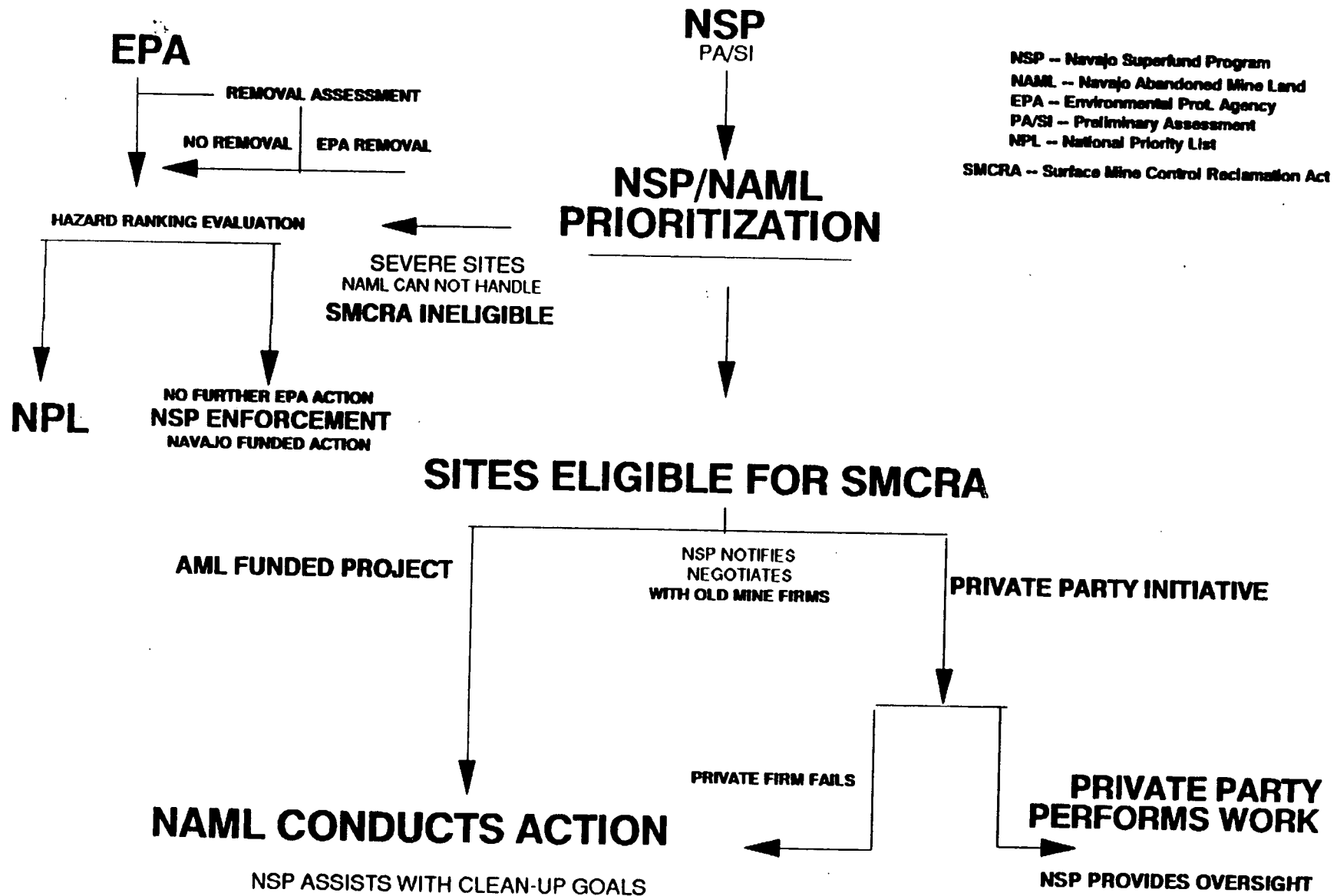
Sincerely,



Robert E. Bornstein
Federal On-Scene-Coordinator
Emergency Response Section

cc: Ronald Sassaman, DOI-OSM (w/o enclosures)
Raymond Churan, DOI-OEA (w/o enclosures)
Joanne Manygoats, NSP (w/o enclosures)

Enclosures (2)

DRAFT**SCHEME TO ADDRESS URANIUM MINE SITES**

AGENDA

NAVAJO URANIUM MINE WASTES

JANUARY 22, 1992

**Rm 1431A
517 Gold Ave SW
ALBUQUERQUE, N.M.**

Morning session limited to DOI and EPA attendees

9:30am Introductions
**9:40 EPA proposal for utilization of Navajo AMLF and cost
 recovery**
10:30 DOI questions
10:30 DOI/EPA agreements reached
12:00 Lunch

Afternoon session includes Navajo Tribal Representatives and ATSDR

1:30 Introductions
1:45 Presentation of situation to tribal representatives
2:30 Tribal questions and concerns
3:30 Agreements reached
4:00 Adjourn



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IX

75 Hawthorne Street
San Francisco, Ca. 94105-3901

Received DOE
Grand Jct. Proj. Office

DEC 05 1991

December 2, 1991

MEMORANDUM

SUBJECT: Final Report by Cerrillos Land Company, Clean-up
Action on Section 19, T13N, R10W of McKinley County.

FROM: Robert Bornstein *RB*
Federal On-Scene-Coordinator

TO: Bill Nelson, ATSDR (for distribution among ATSDR)
Ray Churan, DOI (for distribution among DOI agencies)
Stan Edison, Navajo Superfund (for distribution)
Linda Wandres, ORC
Bob Ivey, DOE

Enclosed is a copy of the post-removal report by Cerrillos Land Company. The report was submitted to EPA pursuant to EPA Order 91-16. If you need a copy of the post removal contour map please request a copy from Mr. Paul Eby of Cerrillos Land Company at 505-880-5300. Their post removal survey indicates that the site's gamma radiation levels have been significantly reduced to below 71 uR/hr (50 uR/hr divided by their instrument conversion factor of .7). Overall, within the reclaimed areas, the section is reading approximately 28 uR/hr.

If you have any questions regarding this report, please contact me at 415-744-2298.

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Cerrillos Land Company

6200 Uptown Blvd. N.E., Suite 400
Albuquerque, New Mexico 87110
Box 27019
Albuquerque, New Mexico 87125
505/880-5300 Fax# 505/880-5435

November 27, 1991

United States Environmental
Protection Agency
Region 1X
75 Hawthorne Street
San Francisco, CA 94105

ATTENTION: Mr. Robert Bornstein
On-Scene Coordinator
Emergency Response Section (H-8-3)

RE: Post Response Report
EPA Order 91-16

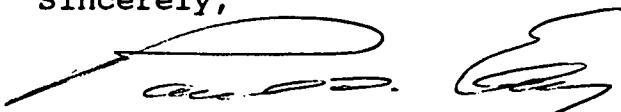
Dear Mr. Bornstein:

I am submitting for your approval the Post Response Report detailing response action taken on EPA Order 91-16. Also attached are the Affidavit, Pre-Response Survey, Post-Response Survey and related field documentation.

I want to thank you again for the guidance and cooperation you have provided during this project.

Should you require additional information, please contact me at this office.

Sincerely,



Paul G. Eby
Director - Field Operations

PGE/ps

cc: Tim Leftwich, w/Attachments
Wayne Jarke, w/Attachments
Denny Cole, w/Attachments
Project File, w/Attachments

Attachments

Cerrillos Land Company

6200 Uptown Blvd. N.E., Suite 400
Albuquerque, New Mexico 87110
Box 27019
Albuquerque, New Mexico 87125
505/880-5300 Fax# 505/880-5435

POST RESPONSE REPORT

EPA ORDER 91-16

Receipt of Order

On August 5, 1991, Cerrillos Land Company received EPA Order 91-16. This order designated Cerrillos as a potentially responsible party for elevated gamma radiation from uranium sub-ore grade mine waste and large shallow open pits located in the NW 1/4, Section 19, Township 13N, Range 10W of McKinley County, New Mexico, where Cerrillos retains ownership of the mineral rights. The basis of this order was for Cerrillos to reduce the potentially hazardous gamma emissions from the site to a level acceptable to all agencies concerned (165 uR/hr above background or to a total of 180 uR/hr) in order to remediate potential health risk to families living nearby.

Acceptance of Order

As provided for in the order, Cerrillos Land Company requested a conference with EPA representatives in order to determine the exact nature of the order, for legal clarification and for guidelines on how to proceed. This accomplished, Cerrillos accepted the order on August 28, 1991, and proceeded with compliance.

Submittal of Site Work Plan - Health and Safety Plan

On August 28, 1991, a final Site Work Plan and Site Health and Safety Plan, detailing actions necessary to comply with the order, were submitted for approval. Included with the Work Plan was the pre-response gamma survey map, statement of qualifications for the contractor selected and statement of

qualifications for the on-site coordinator. Approval of these Plans was received on September 4, 1991.

Cerrillos Personnel

Cerrillos personnel assigned the responsibility to comply with the order, their titles, and areas of responsibility are as follows:

PAUL G. EBY - DIRECTOR, FIELD OPERATIONS

Project Manager responsible for contractor selection and all physical work done at the site. Responsible for compliance with the Work Plan and Health and Safety Plan.

TIM LEFTWICH - DIRECTOR, ENVIRONMENTAL QUALITY

Contact for regulatory agencies. Provided consultation for scope and direction of all phases of project. Direct oversight responsibility for environmental and health issues relative to project.

BILL HARRISON - PROJECT ON-SITE COORDINATOR

On-site responsibility for compliance with Work Plan and Health and Safety Plan. On-site responsibility for coordination of reading gamma emissions of materials being moved and carrying out instructions from Project Manager. Controlled access to site and scanned personnel leaving site.

TONY J. CANABA - FIELD OPERATIONS - GRADE CONTROL

Provided gamma readings to contractor.

MARK GRAY - FIELD TECHNICIAN - GRADE CONTROL

Provided gamma readings to contractor.

Contractor Personnel and Equipment

Taylor Services of Grants, New Mexico, was the contractor selected by Cerrillos for site stabilization work. They have provided excellent, responsive and cost effective work on a very complex project. Key personnel are listed below:

Larry Taylor - Owner - Superintendent
Tony Canaba - Foreman - Operator
Dale Rowe - Operator
Paul Rowe - Operator
Mike McGinn - Operator
Rudy Purilla - Operator
Richard Grey - Operator
Raul Zapata - Driver
Multiple - Laborers

The primary equipment provided by Taylor Services for this project was either new or substantially equivalent to new. All equipment listed below was not run continuously, but on an as-needed basis.

3 - D-8 size Bulldozers
1 - D-6 size Bulldozer
1 - Front-End Loader (6 yd.)
1 - Road Grader
1 - End-Dump Truck
3 - Belly-Dump Trucks (Sub-contract)
1 - Office Trailer - Lunchroom

Contractor compliance with the Health and Safety Plan was excellent. Primary equipment had pressurized cabs and all equipment had back-up horns. Personnel wore hard hats, safety shoes or boots, safety glasses, radiation badges, and

respirators when required. All Taylor and Cerrillos personnel were scanned for radiation before leaving the site.

Site Stabilization

Upon acceptance of EPA Order 91-16, Cerrillos was determined to reduce gamma radiation at the site to the lowest practical level below the required 180 uR/hr while using on-site fill and cover material. The initial gamma survey that was included with the Work Plan outlined an area of approximately 80 acres that would require either cut, fill, level, cover, transport, or some combination of these operations.

Earth moving operations began on September 4, 1991, on schedule. Initial operations began slowly with the use of one large bulldozer and one large front-end loader to allow Cerrillos' Project Manager and contractor to formulate a detailed equipment schedule and plan of operations. It was determined that each of the dozens of waste piles presented its own individual problems and that no real pattern existed. As the area had been mined by several companies, each waste pile must have been moved more than once and some, several times.

The resulting plan was to first level the pit floors to allow equipment access and to then fill the pits with the highest reading material on-site. Waste piles would be stripped, segmented and pushed in order to separate the "hotter" material from the lower reading material that would be used for cover or top dressing. Depending upon the proximity to a pit, this "hotter" material would be pushed, loaded and hauled, or leveled in place. All areas of higher readings would then be contoured and covered with lower reading or neutral material that would be transported by truck, if necessary. Grade Control Technicians on the ground would coordinate all machine operations.

During the second and third weeks of September, several more pieces of machinery were added and the project schedule accelerated to the maximum manageable level. Work proceeded, as planned, with only minor deviations. Some material had to be moved or covered two or more times to achieve acceptable readings. Mass effect in a larger area such as this proved difficult. Also, every effort was made to save as many Juniper and Piñon trees as possible. By mid-November, all areas were covered, contoured and made ready for the post-response survey and subsequent seeding.

Post Response Survey

The post-response radiometric survey over the property was performed by first laying out a 250' x 250' control grid over the area of disturbance. This was done with the use of a Brunton compass, tripod and a 300' tape. At that point, each 250' grid was internally divided into a 50' grid, again utilizing the 300' tape and setting pin flags at all points. Four Ludlum model 19 instruments, each calibrated against its own check source, were then used for the survey. This was performed using a measuring line and four men, each with an instrument held at a height of one meter above the ground and walking on 12 1/2' centers on east-west lines to cover the entire property. At 50' intervals, the highest reading from each instrument for that line was recorded on a chart. This then provided five line readings for 50' grid, the highest of which was then recorded on the grid map provided as the final post-response survey.

The 500' x 500' grid sections on this map are numbered to correspond with the pre-response survey map submitted previously. Copies of each are submitted with this report. For your further edification, we are submitting the 500' x 500' grid charts showing line readings for each of the 50' x 50' grids.

All readings are below 50 uR/hr, uncorrected, which was Cerrillos' target level for the project.

Seeding Operations

Following the post response survey, seeding operations were delayed due to rain and snow. After the weather cleared and the ground dried sufficiently, seeding began on November 24th. Target date for completion is December 3rd.

Seed selection for the site included two warm season grasses, two cool season grasses and one forb. All are native to the area, are palatable to livestock, and demonstrate vigorous growth potential. Seed was blended for planting as follows:

<u>Species</u>	<u>Variety</u>	<u>Rate PLS/ACRE</u>
Blue Gramma	Hachita	2
Sideoats Gramma	El Reno	4
Indian Ricegrass	Paloma	3
Western Wheatgrass	Arriba	4
Fourwing Saltbrush	N.M. Origin	<u>2</u>
	TOTAL	15

Signs and Posting

Ten signs identical to EPA postings were acquired from Sign Art of New Mexico. All hazard warnings are in English, Navajo and Spanish. Posts were acquired from Unistrut and were 1 3/4" x 1 3/4" x 8'. Each sign was fitted with two posts and bolted with six carriage bolts each. Posts were set in cement two feet in the ground and were posted throughout the site opposite all access points.

Project Cost

Approximate expenditures on the project for all direct charged costs are as follows:

Title Work	\$ 5,188
Ground Survey	7,142
Aerial Survey & Mapping	3,690
Instruments	5,515
On-Site Coordinator & Technician	17,670
Dirt Contractor	175,305
Seed	5,822
Miscellaneous	<u>2,383</u>
DIRECT PROJECT COST	\$222,715

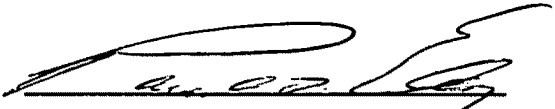
Conclusion of Report

Affidavit attached.

Affidavit

I, Paul G. Eby, being duly sworn and having direct knowledge of the following matters, do certify under penalty of law that based on my personal knowledge and appropriate inquiries of all other persons involved in the preparation of the report to which this affidavit is appended, the information submitted is true, accurate, and complete to the best of my knowledge and belief.


Dated Nov. 26, 1991



Paul G. Eby

STATE OF NEW MEXICO)
) ss.
COUNTY OF BERNALILLO)

The foregoing instrument was acknowledged before me this 26th day of November, 1991, by Paul G. Eby, the Director - Field Operations of Cerrillos Land Company, a Delaware corporation, on behalf of said corporation.



Notary Public

My commission expires:

September 20, 1994

HAYSTACK MOUNTAIN PROJECTGrid No. 5

Date _____

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HAYSTACK MOUNTAIN PROJECTGrid No. 10

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HAYSTACK MOUNTAIN PROJECTGrid No. 11

Date _____

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<u>16</u> <u>10</u> <u>7</u> <u>10</u>	<u>14</u> <u>14</u> <u>12</u> <u>10</u>	<u>22</u> <u>14</u> <u>14</u> <u>14</u>	<u>8</u> <u>16</u> <u>14</u> <u>14</u>	<u>12</u> <u>12</u> <u>12</u> <u>12</u>	<u>12</u> <u>12</u> <u>12</u> <u>18</u>	<u>12</u> <u>12</u> <u>12</u> <u>12</u>	<u>12</u> <u>12</u> <u>12</u> <u>14</u>	<u>12</u> <u>20</u> <u>22</u> <u>12</u>	<u>24</u> <u>24</u> <u>24</u> <u>34</u>
<u>12</u> <u>10</u> <u>11</u> <u>10</u>	<u>12</u> <u>14</u> <u>16</u> <u>12</u>	<u>14</u> <u>12</u> <u>14</u> <u>14</u>	<u>16</u> <u>14</u> <u>15</u> <u>14</u>	<u>12</u> <u>12</u> <u>12</u> <u>16</u>	<u>12</u> <u>12</u> <u>12</u> <u>12</u>	<u>12</u> <u>12</u> <u>12</u> <u>14</u>	<u>18</u> <u>12</u> <u>12</u> <u>16</u>	<u>12</u> <u>20</u> <u>12</u> <u>16</u>	<u>24</u> <u>24</u> <u>24</u> <u>20</u>
<u>12</u> <u>12</u> <u>11</u> <u>12</u>	<u>12</u> <u>10</u> <u>15</u> <u>12</u>	<u>12</u> <u>12</u> <u>14</u> <u>12</u>	<u>12</u> <u>14</u> <u>14</u> <u>14</u>	<u>14</u> <u>12</u> <u>12</u> <u>12</u>	<u>14</u> <u>16</u> <u>14</u> <u>16</u>	<u>14</u> <u>12</u> <u>12</u> <u>12</u>	<u>16</u> <u>14</u> <u>16</u> <u>20</u>	<u>14</u> <u>14</u> <u>12</u> <u>16</u>	<u>18</u> <u>12</u> <u>14</u> <u>12</u>
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HAYSTACK MOUNTAIN PROJECTGrid No. 13

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<u>30</u> <u>20</u> <u>20</u> <u>22</u>	<u>22</u> <u>18</u> <u>16</u> <u>20</u>	<u>28</u> <u>20</u> <u>18</u> <u>16</u>	<u>24</u> <u>32</u> <u>32</u> <u>34</u>	<u>32</u> <u>30</u> <u>30</u> <u>30</u>	<u>34</u> <u>26</u> <u>28</u> <u>26</u>	<u>40</u> <u>34</u> <u>32</u> <u>34</u>	<u>28</u> <u>20</u> <u>40</u> <u>38</u>	<u>32</u> <u>28</u> <u>26</u> <u>34</u>	<u>20</u> <u>26</u> <u>28</u> <u>26</u>
<u>26</u> <u>22</u> <u>20</u> <u>24</u>	<u>22</u> <u>20</u> <u>32</u> <u>24</u>	<u>30</u> <u>26</u> <u>20</u> <u>22</u>	<u>24</u> <u>20</u> <u>24</u> <u>26</u>	<u>28</u> <u>24</u> <u>26</u> <u>24</u>	<u>28</u> <u>26</u> <u>20</u> <u>28</u>	<u>34</u> <u>20</u> <u>30</u> <u>32</u>	<u>38</u> <u>22</u> <u>30</u> <u>32</u>	<u>32</u> <u>26</u> <u>30</u> <u>34</u>	<u>38</u> <u>22</u> <u>20</u> <u>24</u>
<u>28</u> <u>30</u> <u>34</u> <u>34</u>	<u>22</u> <u>26</u> <u>28</u> <u>30</u>	<u>28</u> <u>24</u> <u>30</u> <u>30</u>	<u>24</u> <u>24</u> <u>24</u> <u>24</u>	<u>28</u> <u>24</u> <u>26</u> <u>36</u>	<u>30</u> <u>26</u> <u>26</u> <u>28</u>	<u>30</u> <u>34</u> <u>44</u> <u>32</u>	<u>30</u> <u>28</u> <u>34</u> <u>32</u>	<u>32</u> <u>20</u> <u>32</u> <u>32</u>	<u>30</u> <u>28</u> <u>36</u> <u>24</u>
<u>38</u> <u>36</u> <u>42</u> <u>32</u>	<u>40</u> <u>48</u> <u>40</u> <u>34</u>	<u>32</u> <u>30</u> <u>46</u> <u>36</u>	<u>24</u> <u>28</u> <u>34</u> <u>36</u>	<u>30</u> <u>30</u> <u>28</u> <u>30</u>	<u>32</u> <u>26</u> <u>32</u> <u>30</u>	<u>24</u> <u>20</u> <u>20</u> <u>36</u>	<u>42</u> <u>40</u> <u>40</u> <u>34</u>	<u>36</u> <u>28</u> <u>34</u> <u>26</u>	<u>34</u> <u>24</u> <u>26</u> <u>34</u>
<u>30</u> <u>22</u> <u>22</u> <u>26</u>	<u>36</u> <u>24</u> <u>22</u> <u>24</u>	<u>38</u> <u>40</u> <u>42</u> <u>32</u>	<u>30</u> <u>28</u> <u>30</u> <u>26</u>	<u>22</u> <u>30</u> <u>28</u> <u>28</u>	<u>30</u> <u>20</u> <u>26</u> <u>24</u>	<u>40</u> <u>22</u> <u>28</u> <u>26</u>	<u>40</u> <u>26</u> <u>24</u> <u>24</u>	<u>22</u> <u>20</u> <u>22</u> <u>20</u>	<u>24</u> <u>22</u> <u>28</u> <u>24</u>

HAYSTACK MOUNTAIN PROJECTGrid No. 15

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HAYSTACK MOUNTAIN PROJECT

Grid No. 17

Date _____

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HAYSTACK MOUNTAIN PROJECTGrid No. 18

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8	9	9	12	14	14	20	28	22	20
8	10	10	12	12	14	20	22	26	22
12	12	12	12	14	16	18	20	22	24
10	9	10	10	12	14	16	18	12	20
11	14	10	10	11	12	16	16	26	22
12	12	10	10	11	12	16	16	22	20
12	12	12	10	14	16	22	24	24	20
10	12	12	10	12	18	18	16	22	18
11	10	12	12	16	16	18	25	32	20
10	10	10	12	22	20	22	26	18	18
12	12	20	24	28	38	40	26	26	24
9	12	12	12	16	36	34	32	22	26
9	10	12	14	16	22	22	46	40	28
10	8	12	14	34	26	38	42	42	30
12	14	16	22	40	30	38	40	26	22
30	12	16	24	40	20	38	38	32	40
26	12	18	22	20	18	38	36	30	32
22	12	18	18	18	16	32	32	24	26
20	22	12	12	22	20	28	34	24	20
8	12	11	16	18	18	32	30	22	22
10	12	11	16	18	16	28	30	24	22
10	12	10	10	12	18	26	22	24	32

HAYSTACK MOUNTAIN PROJECTGrid No. 20

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HAYSTACK MOUNTAIN PROJECTGrid No. 21

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HAYSTACK MOUNTAIN PROJECT

Grid No. 23

Date _____

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Received DOE
Grand Jct. Proj. Office

REGION IX

75 Hawthorne Street
San Francisco, Ca. 94105-3901

OCT 31 1991

September 29, 1991

MEMORANDUMSUBJECT: OSC Report for the Bluewater Uranium Mine Sites,
Navajo Nation, Prewitt, New MexicoFROM: Robert Bornstein *RB*
On-Scene-Coordinator H-8-3TO: Robert Ivey
Department of Energy

Enclosed for your review is a copy of the On-Scene-Coordinator Report for the ERS response at the Bluewater Uranium Mine Sites, Prewitt, New Mexico.

I want to thank you for your support throughout this project.

If you have any questions about the report please contact me at 415-744-2298.

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX

75 Hawthorne Street
San Francisco, Ca. 94105

SEP 26 1991

September 23, 1991

MEMORANDUM

SUBJECT: Bluewater Uranium Mine Sites, Prewitt, New Mexico

FROM: Robert Bornstein, OSC *RB*
USEPA-ERS

TO: Bluewater Interagency Members

Enclosed is a summary of the results of our response actions at the Bluewater Uranium sites. If you have any questions, please contact me at 415-744-2298.

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DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service
Agency for Toxic Substances
and Disease Registry

Memorandum

Date **September 24, 1991**

From *William Q. Nelson*
William Q. Nelson, Senior Regional Representative, Region IX

Subject **Review of Response Actions at the Bluewater Uranium Site**

To **Robert Bornstein, EPA OSC/ERS, H-8-3, Rm 8155**

The Agency for Toxic Substances and Disease Registry (ATSDR) has reviewed the draft and final document dated September 23, 1991, describing the past removal action summary of exposure for the above site.

In consultation with Dr. Paul Charp of ATSDR, we find that the described removal actions are satisfactory for those areas indicated and are protective of public health.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IX

75 Hawthorne Street
San Francisco, Ca. 94105

POST REMOVAL ACTION SUMMARY OF EXPOSURE FINAL DARFT September 20, 1991

The Environmental Protection Agency has completed response activities at the Bluewater Uranium Mine Sites located outside of Prewitt, New Mexico. The response activities were conducted to reduce the potential radiological hazards associated with the sites. As a result of previous mining activities and absence of reclamation action, the sites contained large open pits with exposed uranium bearing tailings, protore and tailing piles.

To reduce the potential radiological hazards associated with the sites, EPA conducted the following actions:

- * Filled, graded and applied an earth cover to areas emitting elevated gamma radiation;
- * Filled, sealed and capped mine adits, inclines and shafts;
- * Posted warning signs on site to advise people to not disturbed reclaimed areas;
- * Revegetated affected zones with natural grasses.

Response actions commenced on August 11, 1991. Detailed radiological surveys were conducted at the sites to further delineate areas of concern. On August 19, 1991, Laguna Construction mobilized on site and began earth moving activities. Laguna Construction completed its activities on September 18, 1991.

RESPONSE RESULTS

The National Council on Radiation Protection and Measurements (NCRP) Report 91 (1987) recommends the adoption of a limit for continuous or frequent exposure to radiation, at a 100 mrem/yr effective dose equivalent (EDE) from all radiation sources (including external as well as internal sources but excluding natural background and medical exposures). The NCRP report also recommends that a limit of 500 mrem/yr be established for infrequent or "short term" exposure. In accordance with the above referenced NCRP guidelines, EPA's Office of Air and Radiation (OAR) has concurred with Region IX's Action Memorandum for the Bluewater Sites, which recommends that a limit of <100

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mrem/yr of excess gamma radiation be adopted as a standard in this case.

Natural background gamma radiation from external sources in the vicinity of the Bluewater Uranium Mine Sites varies considerably and is dependent upon local geology. It may be as low as 12 uR/hr in areas lacking natural uranium deposits and as high as 20 uR/hr in areas containing uranium rich ore. Naturally exposed uranium rich Todilto limestone outcrops at the Desiderio Mine Site recorded readings as high as 50 uR/hr at waist level.

For the purpose of this response action, EPA has estimated that the population in question (on average) spends two hours a day for 300 days/yr in the areas affected by mine operations. A more conservative estimate of 7 hours a day was given to EPA by the Navajo Superfund Program in May of 1991.

BROWN-VANDEVER-NANABAH SECTION 24

A 50 foot by 50 foot grid survey was conducted at the Brown-Vandever-Nanabah sites. The results of the post removal survey on Section 24, Township 13N, Range 10W of the Bluewater Quadrangle (Brown-Nanabah site) reveal that gamma radiation levels (once exceeding 500 uR/hr in places) have been drastically reduced. The average gamma reading within the reclaimed area is presently 28 uR/hr. The highest reading recorded within the survey was 56 uR/hr. In addition to reducing gamma radiation emissions, the covering of the protore and mine wastes most likely has reduced the surface radium and other radionuclide concentrations in the top 15 cm of soil (post analytical results are pending), as well as radon flux.

Using the average gamma reading, the population would receive a yearly excess gamma radiation dose of 7.8 mrem/yr. This compares to the average annual background radiation dose received in the United States of 300 mrem/yr as reported by the NCRP.

$$(28 \text{ uR/hr} - 15 \text{ uR/hr}) * 2 \text{ hours} * 300 \text{ days/yr} = 7800 \text{ uR/yr}$$

$$7800 \text{ uR/yr} = 7.8 \text{ mR/yr} = 7.8 \text{ mrem/yr}$$

Using the conservative estimate of 7 hours a day and the average gamma reading for section 24, the excess gamma radiation for 300 days would be 27.3 mrem/year. This exposure is also well below the NCRP standards.

Therefore, in reclaimed areas, using EPA's estimations, the population frequenting the site will not receive any significant excess gamma exposure. Their excess gamma exposures would not exceed the recommended NCRP recommendation.

For frequent exposures (long term) the NCRP recommends,

populations to not exceed 100 mrem/yr EDE from all sources (excluding natural background and medical sources). With background being approximately 15 uR/hr in the affected area, populations could reside on areas of reclaimed land reading 27 uR/hr or less to adequately stay within this guideline (assuming they are not exposed to other excess radiation sources besides uranium chain gamma). Approximately 60% of the reclaimed land is potentially suitable for full time occupancy. These are very conservative calculations because no credit is taken for the shielding effect of the home on any increases in terrestrial radiation.

Additional studies should be conducted within the reclaimed area prior to allowing any homes to be built. However, it is highly unlikely that prior to mining operations, the gamma radiation levels presently being emitted were significantly lower. It is probable that some portions of the strip-mined area were naturally higher than the average background elsewhere as a result of the proximity to the surface of uranium-rich ore.

Therefore, the removal action appears to have effectively reduced the potential radiological hazards associated with the abandoned mine operations and has returned the land to a productive environment. No further action should be warranted on this site.

Population frequenting the reclaimed area, on average, can spend up to 24 hours on site for 300 days out of the year or 21 hours per day for 365 days without exceeding the NCRP recommendation for frequent or continuous occupancy of 100 mrem/yr (assuming no additional pathways, ERS/OAR has collected post removal soil samples and is presenting analyzing them for their radionuclide activity). Prior to mining operations, it is unlikely that gamma radiation readings were significantly lower than those achieved after reclamation.

BROWN-VANDEVER SECTION 18

The post removal survey conducted on Section 18, Township 13N, Range 10W of the USGS Bluewater Quadrangle (the Brown Vandever site) revealed that the average gamma reading was 13 uR/hr. The highest reading was 29 uR/hr. This reading is essentially background and therefore, no additional action should be taken on this section.

DESIDERIO MINE SITE

A post removal survey using a 100 foot by 100 foot grid was conducted on the top 15 acre portion (Starting at the residences and heading due east) at the Desiderio site (Section 26, Township 13N, Range 10W). This survey revealed that the average gamma reading within the reclaimed area was 15 uR/hr. A random survey was conducted on the other reclaimed areas near the road, the once far southern pits, and the old shaft areas. Values ranged from a high of 50 uR/hr to a low of 15 uR/hr. The average reading in

these isolated locations is approximately 28 uR/hr.

Like the Vandever sections, the post removal results at the Desiderio site reveal that the gamma emissions (once exceeding 700 uR/hr in places) have been drastically reduced. Levels present at the site are well within reclamation guideline levels and pose no significant health risks for long term exposures. It is likely that the reclaimed gamma emissions are no greater than those detected prior to mining operations at all three reclaimed sections (Readings of 50 uR/hr were detected on unmined naturally occurring Todilto limestone outcrops).

Overall, the reclamation project has been extremely successful in reducing the potential radiological hazards at the sites.

SUMMARY CONCERNING HOME RADON Composed by Jerry Gils, Health Physicist, REAC

Strip mining operations occurred at both of the Bluewater Uranium Mine Sites in the past, indicating that relatively rich uranium deposits lie fairly close to the surface and in close proximity to the home sites. Two questions need to be answered at these locations: (1) How do indoor concentrations measured at these two sites compare with concentrations measured elsewhere? And, (2) Is it either likely or possible that past mining operations have adversely affected the radon concentrations indoors?

To answer the first question, it has been reported that a concentration of 4.6 pCi/L has been measured at one of the homes at the Desiderio Site, as well as concentrations between 1.5 and 3.3 pCi/L at other homes on site. These measurements were taken with alpha track detectors left in place for two to three months. The results reported at the mine sites are typical for this area (IHS survey, January, 1990,) and in most areas of the country. In the immediate Bluewater area, thirteen homes were measured in the IHS survey, ranging from <1.0 to 7.5 pCi/L, with the average being 2.5 pCi/L. As another point of comparison, a survey in North Dakota showed average radon concentrations of about 6 pCi/L. The conclusion is that there seems to be nothing unusual about the results reported at the two mine sites.

Is it likely, or even possible, that past mining operations have affected indoor concentrations at these sites? The source of indoor radon is the soil in direct proximity to the home. The distance that radon can travel before it decays is directly related to the soil porosity and inversely related to the moisture content. The two mine sites contain a soil horizon composed of fine to coarse grain sand and weathered limestone. The soil porosity is high and the moisture content is low. Therefore, the soil possesses very good soil gas diffusion characteristics. However, since the mean diffusion path length for a radon atom is only a few meters at most before it decays,

and since no mining operations have taken place within 50 meters of any on the homes, it is unlikely that the mining operations have in any way affected the soil gas radon concentrations near the homes.

Since these two sites are not "normal" sites as far as the potential for outdoor concentrations of radon, the additional question might be asked, "Could these homes be affected by airborne radon from nearby exposed uranium seams or open mine shafts?". It is difficult to answer "No" to such a speculative question, since outdoor concentration measurements have never been made to my knowledge. However, it is very unlikely that increases in outdoor concentrations near the homes have occurred as a result of mining operations. The distance of the homes from any potential airborne sources plus the vast volume of mixing air between source and receptor support this conclusion. Indirectly, it must be noted that while radon soil gas measurements have been used as a prospecting tool, radon air concentration measurements have never been used to prospect for uranium. This indicates that increased air concentrations are not associated with rich uranium soil deposits, and thus one would not expect to see any increase in airborne radon concentrations near the homes on these sites.

In conclusion, it does not appear that any "mining enhanced" increased indoor radon concentrations should be expected or have been measured at the homes on the Vandever and Desiderio sites. Additional long-term measurements following EPA protocols may help clarify this conclusion. It is recommended that any new home construction, particularly on land included as part of this removal action, include piping and sub-foundation gravel consistent with EPA recommendations for new home construction, so that if elevated concentrations are encountered (as have been in 8.3% of the homes in the IHS study), mitigation procedures will be cheap and effective.

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IX

**75 Hawthorne Street
San Francisco, Ca. 94105**

June 18, 1991

**Neal D. Kasper
Luguna Construction Company, Inc.
P.O. Box 206
Laguna, New Mexico 87026**

**RE: Potential work at the Bluewater Uranium Mines, Prewitt,
New Mexico.**

Dear Mr. Kasper:

The Bluewater Uranium Sites consist of the Brown-Vandever-Nanabah mines and the Navajo-Desiderio mine. The sites are located approximately five miles west of Prewitt, New Mexico and lie within the Ambrosia Lake subdistrict of the Grants Uranium Mining District.

The Brown-Vandever-Nanabah site encompasses two Indian Allotment parcels (Section 18 Township 13N, Range 10W and Section 24, Township 13N, Range 11W), one Federal parcel administered by the Department of Energy (Section 13, Township 13N Range 11W) and one privately owned parcel (Section 19, Township 13N, Range 10W) within the Bluewater Quadrangle.

At this time, EPA is preparing to undertake a response action at these sites to reduce the gamma radiation and radon gas emissions. Each section consists of several large piles of mine overburden, protore, mine tailings and exposed ore bearing Todilto limestone.

Enclosed for your review is a draft copy of EPA's Action Memorandum which contains additional information concerning the sites and EPA's proposed response. At this time, EPA is negotiating with several of the private "potentially responsible parties" which may have contributed to the pollution problems at the sites. As required by law, EPA is requesting these parties to take the appropriate actions at the sites to mitigate the environmental hazards.

At this time, EPA is quite sure that it will be responsible for the response actions taken on Department of Interior trust lands. This includes the Navajo-Desiderio Mine Site located at Section 26, T13N, R10W of the Bluewater Quadrangle and the Brown-Vandever-Nanabah mines located at Section 18, T13N, R10W and Section 24, T13N, R11W of the Bluewater Quadrangle. EPA estimates that approximately 28 acres of land will need to be

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reworked. However, if the "potentially responsible parties" fail to complete action on their property (Section 19, T113N R10W), EPA will assume the responsibility to conduct actions on this parcel. This would add an additional 5-8 acres of land to the reclamation.

As stated in the Action Memo, EPA will place an earth cover on all areas exceeding 300 uR/hr. Therefore, EPA is planning to conduct an extensive gamma survey prior to operations. The Bureau of Land Management (BLM) will be assisting EPA in developing and permitting a borrow pit for clean-fill. After completion of the covering, EPA expects that the treated areas will be hydroseeded after the rain season. Additional tasks will include backfilling and properly closing mine inclines and shafts (3 openings are estimated).

All workers utilized to complete this operation must meet the requirements specified by the Occupational Safety and Health Administration CFR 24 Part 1910 and EPA Health and Safety plan.

During my visit to Jackpile in early June, I was quite impressed with your massive operation. I believe that your company has the experience and equipment to successfully assist EPA. If you require additional technical information please contact me at 415-744-2298. Contractual issues should be addressed to Jerri Simmons, Contract Officer, at 415-744-1697. I look forward to discussing the sites with you in the near future.

Sincerely,



Robert Bornstein
Federal On-Scene-Coordinator



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IX

75 Hawthorne Street
San Francisco, Ca. 94105

June 7, 1991

MEMORANDUM

SUBJECT: Request for Removal Action Approval at the
Bluewater Uranium Mine Sites, Prewitt, Navajo Nation,
New Mexico

ACTION MEMORANDUM

CERCLIS ID: PENDING

Site ID: W3

Category of Removal: Time Critical

Nationally Significant or Precedent Setting: Yes

FROM: Robert Bornstein *RB*
On-Scene Coordinator, Emergency Response Section
(H-8-3)

TO: Jeff Zelikson
Director, Hazardous Waste Management Div. (H-1)

I. ENDANGERMENT FINDING

This is to request funding approval for CERCLA funded site activities at the subject site. Conditions presently exist at the site which, if not addressed by implementing the response action documented in this Action Memorandum, could cause the local population and wildlife to be exposed to unsafe external gamma radiation and radionuclides.

II. SITE CONDITIONS AND BACKGROUND**A. SITE DESCRIPTION****1. Removal Site Evaluation**

On October 3, 1990, the Emergency Response Section (ERS) was notified by the Agency for Toxic Substance and Disease Registry (ATSDR) of the potential health hazards associated with the uranium mine tailings located at the Brown-Vandever-Nanabah Mines and Navajo-Desiderio Mine, (the Bluewater Uranium Mine Sites). After collecting limited data and conducting several Site visits, ATSDR concluded that the Sites may pose a significant health hazard to the local population because of the presence of radioactive mine tailings, physical hazards, and potential for heavy metal contamination. As a result of their investigation,

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ATSDR issued a Public Health Advisory pursuant to Section 104(i)(6)(H) of CERCLA concerning the Sites on November 21, 1990

EPA Region IX ERS was tasked to assess the present radiological and geochemical conditions at the Sites to determine if an emergency response action is warranted. On November 15-16, 1990, ERS conducted a field gamma survey and collected water and soil samples. In addition, a radon flux measurement was performed on tailings at the Desiderio Mine site.

2. Physical Location

The Brown-Vandever-Nanabah and Navajo-Desiderio mine sites are located approximately five miles west of Prewitt, New Mexico (see attached maps, Appendix A). The sites lie within the Ambrosia Lake subdistrict of the Grants Uranium Mining District. The Brown-Vandever-Nanabah site encompasses approximately 155 acres. Half of this area has been disturbed and scared as a result of uranium mining. The Navajo-Desiderio site covers approximately 130 acres, with nearly 60 acres disturbed by mining activities.

The sites are located on four Indian Allotments and one parcel of Federal land which is administered by the Bureau of Indian Affairs. The mines were operated periodically from 1952-1970 by several mining firms.

The uranium ore is primarily calcium carnoite, $\text{CaO} \cdot 2\text{UO}_3 \cdot \text{V}_2\text{O}_5 \cdot n\text{H}_2\text{O}$, which disseminates through the Jurassic Todilto limestone. Operations at both mine sites consisted of both open pits and underground mines. Open pit mining was conducted predominantly with large front end loaders and haul trucks. The overburden, consisting of topsoil, alluvium, shale and sandstone was blasted, removed and placed in waste piles. Underground mining was conducted by driving adits to the ore zones within the limestone deposit. Ventilation holes and adits are present at both sites. It is estimated by the Navajo Nation that 25,000 tons of uranium ore was removed from these sites. Mined ore which failed to contain significant quantities of uranium were discarded at the mine sites; and no formal reclamation program was undertaken after mining operations ceased.

Because of the dry climate and lack of chemical weathering, these tailing piles remain exposed and the landscape remains scared.

3. Site Characteristics

Several families live and work on both sites. Approximately forty people, including children, live at the Brown-Vandever-Nanabah site and approximately fifty people live at the Desiderio site. Presently, the land is primarily utilized for grazing of local horses, sheep and goats. Throughout the year, the sheep and goats are allowed to roam freely within the mined areas. At the Brown-Vandever-Nanabah site, several homes are situated within a quarter mile from exposed uranium ore. At the Desiderio

site, several family homes surround the mined area.

Presently there are no restriction preventing the local population or livestock access to the tailing piles or mine shafts. The local population often use the tailing piles as observation posts when herding livestock. Local children are known to play on or around the tailings and near the mine shafts. There is also evidence that many of the home owners utilized mine tailing as foundation materials for their structures.

4. Release or Threatened Release into the Environment of a Hazardous Substance, or Pollutant or Contaminant.

On November 15-16, 1990, ERS collected soil, water and air samples at both mine sites. Each mine area was divided into sections and subdivided into sampling stations. Background gamma radiation readings, taken at approximately two miles from the Brown-Vandever-Nanabah site at ground level, were recorded at 11 microroentgens per hour (uR/hr). On Site, readings at ground level ranged from 13 uR/hr at the home sites to 1250 uR/hr within stripped mine pits and 10 uR/hr to 650 uR/hr at waist levels, respectively. Overall, ground level gamma radiation readings within the scared mined areas were recorded to be above 300 uR/hr and waist level readings above 200 uR/hr. At the Desiderio site, the net radiation levels ranged from background to over 350 uR/hr at waist level and over 850 uR/hr on ground contact. Waist level measurements are indictative of human exposure levels and contact measurements suggest the emission rate of the radioactive materials.

Soil samples collected and analyzed for both radium (Ra-226/228) and uranium isotopes (U-233/234/235/238) showed that there were high levels of these radionuclides present within the surface soils. The maximum levels of radioisotopes detected within the top 15 centimeters at the Brown-Vandever-Nanabah site for radium was in excess of 260 picocuries per gram of soil (pCi/g) and for uranium, the maximum level exceeded 390 pCi/g. Similar concentrations of radionuclides were detected at the Desiderio site.

Radon (Rn-222) flux measurements from waste piles were also measured at several stations within the Desiderio mine site. These results revealed that the maximum emission rate of radon was 67 pCi per square meter per second.

No elevated heavy metal concentrations were detected during the November assessment. In addition, potable water samples obtained from taps at both sites indicated that the amount of detected radionuclides were below the Primary Drinking Water Standards.

ATSDR, after review of the data collected by ERS, has concluded (4/22/91 Health Consultation) that the radiation exposure levels at the mine sites poses a severe radiological health hazard to individuals that frequently spend time on the tailings. ATSDR concluded that individuals that frequently work, play or

cross the tailing piles may receive a yearly external radiation exposure of over 100 millirem per year (mrem/yr). The National Council on Radiation Protection and Measurements (NCRP) recommends that continuous or frequent annual external radiation exposure to a population should not exceed 100 millirem per year (mrem/yr) above natural background (cosmic rays, alpha, beta and gamma sources). Population exposed to larger doses could be subjected to an increase cancer rate greater than 1 in 10,000. Both EPA's Office of Air and Radiation and the Department of Energy support the NCRP recommendations.

Several promulgated standards for radioactive material were found to be exceeded by ERS. Soil sampling data indicated that the levels of radium-226 in the top 15 cm of soils exceeds the regulatory limits established in 40 CFR 192. In addition, the radon-222 emission rates exceed the guidelines of 20 pCi per square meter per second outlined in 40 CFR 192.

The radionuclides present within the soil are "hazardous substances" as defined in Section 101(14) of CERCLA, 42 U.S.C. Section 9601(14).

The local population are potentially being exposed to the radiation through the following pathways:

- * Inhalation of radon daughters (decay isotopes);
- * Direct exposure to elevated gamma radiation;
- * Inhalation and ingestion of airborne radioactive particles, including alpha emitters.
- * Ingestion of contaminated meat

5. NPL Status

The two mine sites are not currently on the National Priority List. As a result of the Health Advisory, the Navajo Superfund Office, with assistance from EPA Region IX Site Evaluation Section, is presently reviewing the sites using the Hazard Ranking Scoring model.

6. Maps, Pictures and Other Graphic Representations

Appendix A contains a map of the location of the Sites and a copy of the ATSDR Health Advisory and Health Consultation.

B. OTHER ACTIONS TO DATE

1. Previous Actions

As discussed, the two sites were initially referred to EPA ERS by ATSDR in October of 1990. At that time, ATSDR was preparing to issue a Public Health Advisory. EPA ERS was tasked to complete a preliminary investigation at the Sites to determine if an emergency removal action was warranted.

In order to prepare for this investigation, ERS consulted with the Office of Air and Radiation Region IX and Las Vegas

laboratory, Navajo Superfund Program, ATSDR, and the Indian Health Services. A site specific sampling plan was drafted and reviewed by the various interagency representatives.

On November 15-16, ERS, accompanied by members of the Office of Air and Radiation-Las Vegas Laboratory, EPA's Technical Assistance Team (TAT) contractor, Ecology and Environment, and members of the Navajo Superfund Program conducted an extensive gamma radiation and radionuclide assessment.

Soil, water and air samples were collected during the assessment and analyzed by Eberline Laboratory in Albuquerque, New Mexico. The data was received by EPA ERS in January of 1991.

To assist ERS Region IX in interpreting the results of the radiological survey, copies of the assessment data were forwarded to Bill Nelson, Region IX ATSDR Coordinator, Richard Guimond, Director of the Office of Air and Radiation, and Stephen Luftig, Director of the Environmental Response Division. ERS requested assistance in determining if the sites posed an acute (need to do a removal action) or a chronic (remedial action more appropriate) health risk.

In addition to reviewing the data, ERS began to research and investigate the historical records of the mine sites in order to determine potential responsible parties.

ERS notified William Allen, Regional Environmental Assistant for the Department of Interior about the sites and forwarded copies of the assessment data to the Bureau of Indian Affairs, Bureau of Land Management, and Indian Health Service. To acquire site specific lease information, a CERCLA 104E letter was issued to the Bureau of Indian Affairs, Navajo Office. In addition, a copy of the assessment data was forwarded to the Department of Energy, Grand Junction, Colorado.

On April 8, 1991 members of the Bureau of Indian Affairs (BIA), Bureau of Land Management (BLM), Office of Surface Mining, Indian Health Service (IHS) and the Navajo Nation met to discuss the sites. The various representatives provided background on the sites and their activities to date. In addition, potential response actions to reduce the radiological hazards were discussed including mine reclamation activities.

2. Current Actions

On April 22, 1991, ERS received ATSDR's Health Consultation concerning the assessment data. ATSDR concluded the following:

- * radiation exposure at these sites could result in adverse health effects depending on the amount of time spent in radioactively contaminated areas. The residential areas appear to be relatively safe; whereas, if much time is spent in areas containing the waste piles, an imminent health problem could surface.

- * Radionuclide concentrations within the top soil and radon gas emissions at the sites exceed the promulgated standards.
- * Heavy metals do not pose a health hazard to the residents as initially believed in the Public Health Advisory

ATSDR recommended that additional radiological data be collected at the sites to further assess radon gas emissions, livestock and biota uptake. In addition, the Agency recommended that appropriate measures be immediately undertaken to effectively restrict site access to the local population or reduce the amount of radiological emissions.

On April 15, 1991, the Office of Air and Radiation responded to ERS's request for technical assistance in interpreting the assessment data. Based on the data and information gathered during the assessment, OAR determined that a significant risk may be posed at least one of the sites. However, OAR was not able to conclude without additional data whether the sites pose an acute or chronic threat. OAR recommended that additional data be collected to further assess the radiological hazards. OAR has directed its Las Vegas Laboratory to draft a sampling and data analysis workplan for assessing releases of radionuclides into pathways not addressed during ERS's assessment. The Las Vegas laboratory plans to assess the amount of radon and gamma-ray exposure in homes, radon emanating from mine vents, and radionuclides entering the food chain.

Considering ATSDR's and EPA's concerns, and the length of time that it could take EPA to determine which authority to use to address the conditions at the sites, ERS has decided that the most prudent course of action is to pursue a response action at the sites which would address the most significant radiological hazards. Once this "hot spot control" action is complete, EPA could then continue to investigate and study the sites to assess if additional actions are required.

C. STATE AND LOCAL AUTHORITIES' ROLES

1. State and Local Actions to Date

The Navajo Superfund Program has been actively investigating both sites since 1989. As part of the pre-remedial process authorized under CERCLA, the Navajo Superfund Program has conducted Preliminary Assessment (PA) reports for both sites in 1990. After review of the PA reports, the Navajo Superfund Program referred the sites to EPA Region VI Site Evaluation Section.

EPA Region VI Site Evaluation Section recommended high priority Screening Site Inspections (SSIs) in August and Septem-

ber of 1990. In October, 1990, under a new Interagency Agreement, EPA Region IX became the lead agency overseeing the Navajo Nation.

The Navajo Superfund Program assisted ERS in conducting its assessment in November of 1990. The Navajo Superfund Program reviewed and commented on ERS's work and sampling plans. During the assessment, representatives of the Navajo Superfund Program accompanied ERS in the field and helped communicate with the local population.

In addition to assisting ERS with its investigation, the Navajo Superfund Program has conducted several independent studies at the sites. In November of 1990, the Navajo Superfund Program conducted a limited home radon gas study. The data obtained revealed that radon gas within homes at the sites does not appear to be a problem. However, samples collected from carbon canisters placed near mine vents contained extremely high radon concentrations.

2. Potential for Continued State/local Responses

The Navajo Superfund Program is continuing its investigation at the sites. In April of 1991, the Navajo Superfund Program completed an Air Pathway Risk Assessment report for the Brown-Vandaver-Nanabah Mines and determined that the sites posed an increase cancer risk from particulate dispersion.

The Navajo Superfund Program has stated that it will continue to assist EPA in conducting community relations and radiological investigations. However, the Navajo Superfund Program does not pose the resources or finances to perform a response action at the sites.

III. Threat to Public Health or Welfare or the Environment

A. Threats to Public Health or Welfare

Pursuant to Section 300.415(b)(2) of the National Contingency Plan (NCP) the following conditions necessary for initiating a removal action exist:

1. Actual or potential exposure to hazardous substances or pollutants or contaminants by nearby populations, animals, food chain -- Without immediate action, the local population may be exposed to dangerous doses of gamma radiation and elevated concentrations of radionuclides.

Constant or frequent exposure to elevated gamma radiation is known to cause cancer, life span shortening and cataracts. The inhalation of radionuclides exposes internal organs to damaging alpha particles. Uranium and several of its decay daughters are alpha radiation emitters. Once ingested, the alpha particle is trapped within the body and can cause severe organ damage and genetic defects. Radiation is a known carcinogen, mutagen and teratogen.

2. High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate -- Elevated concentrations of radionuclides exist within the soils present at the mine sites. As a result of frequent high winds, these contaminants are being dispersed and migrating.

3. Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released -- Although the area is relatively dry, the Bluewater District is often subjected to severe thunderstorms and flash flooding. As a result, the mine tailings are slowly being broken down and transported both by alluvial and fluvial forces.

4. Availability of other appropriate Federal or State response mechanisms to respond to the release-- The Navajo Superfund Program has informed EPA that the cost to stabilize the sites exceeds their response capability.

B. THREATS TO THE ENVIRONMENT

The high emissions of gamma radiation being emitted from the tailing piles may adversely effect the local biota and wildlife. As stated, the land is primarily utilized as grazing grounds for local sheep and goat herds. It is probable that the radionuclides are entering into the local food chain as the livestock ingests the contaminated biota.

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this Action Memorandum, may present an imminent and substantial endangerment to public health, or welfare, or the environment.

V. PROPOSED ACTIONS AND ESTIMATED COSTS

A. PROPOSED ACTIONS

1. Planned Action

To reduce the immediate potential radiological hazards associated with the two mine sites, ERS proposes to conduct the following response action:

Phase 1

For areas with frequent public and grazing use, grade and apply earth cover to areas emitting gamma radiation greater than 300 uR/hr;

Phase 2

Fill, seal and cap mine adits, inclines and ventilation shafts to reduce radon gas emissions;

Phase 3

For areas with limited public use, post signs warning of radiological hazards in English, Spanish, and

Navajo.

A guideline of 300 uR/hr was selected using the following standard and assumptions:

Standard

- * The National Council on Radiation Protection recommends that the continuous or frequent annual external radiation exposure to a population should not exceed 100 mrem/y above background. The total natural gamma radiation background from all sources is estimated to be 100 mrem/y. With gamma radiation 1 rem is approximately equal to 1 R.

Assumptions

- * ERS assumes that the average population spends 2 hrs a day within the affected zones for approximately 300 days out of the year.
- * If exposed to an area emitting 300 uR/hr for the total time spent within the affected areas, the population would receive the following gamma radiation exposure:

$$300 \text{ uR/hr} * 2 \text{ hr} * 300 \text{ per year} = 180,000 \text{ uR/yr or } 180 \text{ mR/yr}$$

Subtracting background (100 mrem/yr), the population would be exposed to 80 mR/yr of gamma radiation (180 mR/yr - 100 mR/yr = 80 mR/yr or 80 mrem/yr). Therefore, the population would be exposed to approximately 80 mrem/yr over background.

Levels below 300 uR/hr are considered to be within the acceptable yearly exposure range and do not warrant a removal action.

Since, at this time, EPA does not have any set promulgated radiological action levels for conducting removal actions, ERS believes this calculation will be effective in mitigating any immediate radiological hazards present at these sites. However, this method of selecting "hot zones" may not necessarily be used to select future radiological areas on these sites or future similar sites.

Phase 1 Activities

ERS has estimated that a total of 25 acres of mine tailings, will require covering at the Brown-Vandever-Nanabah location and approximately 5 acres will need to be covered at the Desiderio site. A more thorough and complete gamma survey will be conducted at the two mine sites to further define and identify areas exceeding 300 uR/hr. The earth cover will include two layers; 1 one foot layer composed of low porosity shale or mud, and the other, composed of topsoil. This cover specification was selected using the Nuclear Regulatory radon attenuation model and should sufficiently reduce the amount of both radon and gamma emissions to the standards specified under the Uranium Mill Tailing Radiation Control Act (UMTRA) of 1978 (radon gas emissions below 3 pCi/l

above background and 57 uR/hr above background).

The covering operation will employ the use of several large earth moving tractors and equipment. ERS estimates that three D-9 tractors, equipped with earth rippers, two large graders, a large sheep foot compactor, several large earth scrapers and water trucks will be required. The cover material, clay and topsoil, will be removed and transported to the sites from neighboring Bureau of Land Management land. Finally, after the cover is applied, the treated areas will be hydroseeded to control erosion and rain run-off.

ERS plans to work closely and consult the Bureau of Land Management, the Bureau of Indian Affairs and Office of Surface Mining in coordinating and implementing phase 1 activities.

Phase 2 Activities

Phase two operations will consist of backfilling and sealing open mine adits, ventilation shafts and mine shafts to reduce the emission of radon gas. Ventilation shafts will be backfilled using gravel and then plugged with a 2-5 foot thick layer of concrete. ERS has estimated that 100 to 200 yards of gravel would be required to fill each ventilation shaft. Mine adits and openings will be filled with earth fill and plugged with concrete. ERS has identified two mine ventilation shafts, one adit, and one vertical mine shaft located on the Brown-Vandever-Nanabah site and two adits located at the Desiderio site.

Phase 3 Activities

Phase 3 would consist of erecting warning signs around the steep tailing piles which are not frequently visited by the local population. The warning signs will be in English, Spanish and Navajo.

2. Contribution to remedial performance

The removal actions proposed in this Action Memorandum will alleviate all the potential immediate hazards. Once this "hot spot control" response action is completed, additional studies will be undertaken to determine if additional removal or remedial actions are warranted. ERS believes that the proposed actions will not adversely impact but enhance any future remedial activities.

3. Description of alternative technologies

ERS is not planning to utilize any alternative technologies during this response action. Activities planned for this removal action are considered to be the most effective and best available technologies in alleviating the identified hazards.

4. Applicable or relevant and appropriate requirements (ARARS)

Federal ARARS -- Toxic Substance Control Act
Resource Conservation and Recovery Act
Clean Air Act
Surface, Exploration, Mining and Reclamation of Lands (25 CFR Part 216)
Uranium Mill Tailings Radiation Control Act

Navajo Nation ARARS -- None identified at this time

B. ESTIMATED COSTS

Appendix B contains a cost break down generated by the Removal Cost Management System. It is estimated that the removal action will cost \$1,000,000. Of this, an estimated \$100,000 comes from Regional Allowances. This project estimation includes a 15% Extramural Contingency factor and a 10% Project Contingency factor. This cost projection includes use of Davis-Bacon wage provisions.

ERS estimates that it will take approximately three weeks to complete site work.

VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

If immediate action is not taken at the Site, the local population will continue to be exposed to potentially hazardous yearly doses of gamma radiation and radionuclides. It is unlikely that the remedial program could clean-up the sites within the upcoming year.

VII. OUTSTANDING POLICY ISSUES

This removal action is considered to be nationally significant. Pursuant to OSWER Directive 9360.0-19, removal actions involving mining sites, radiation sites and those occurring on tribal lands are subjected to EPA Headquarters concurrence. Therefore, this action memo will be routed to Headquarters for concurrence.

VIII. ENFORCEMENT

See Appendix C

IX. RECOMMENDATION

This decision document represents the selected removal action for the Bluewater Uranium Mine Sites, Navajo Nation, New Mexico in accordance with CERCLA, as amended by SARA, and, is not inconsistent with, the National Contingency Plan. This decision is based on the administrative record for the site.

The total project ceiling is estimated to be \$1,000,000.

U.S. Department of Labor



GENERAL WAGE DECISION NO. NM91-2

Supersedes General Wage Decision No. NM90-2

State: NEW MEXICO

County(ies): Statewide (excluding Bernalillo, Dona Ana, Los Alamos and Santa Fe Counties).

Construction
Type: Streets, Highway, Utility and Light Engineering

Construction

Description: STREETS, HIGHWAY, UTILITY AND LIGHT ENGINEERING
CONSTRUCTION shall include the construction, alteration, repair and demolition of roads, streets, highways, alleys, sidewalks, curbs, gutters, guard rails, fences, parkways, parking areas, airports (other than buildings thereon), bridle paths, athletic fields, highway bridges, median channels and grade separations involving highways; parks, golf courses, viaducts; uncovered reservoirs and uncovered sewage and water treatment facilities; canals, ditches and channels (including linings other than concrete linings); earth dams under one million (1,000,000) cubic yards; well drilling, telephone and electrical transmission lines and site preparations which are part of streets, highway, utility and light engineering projects; and shall include construction, alteration, repair, and demolition of utilities such as sanitary sewers, storm sewers, water lines, gas lines, including appurtenances thereto such as lift stations, inlets, manholes, sewer lagoons, septic tanks and service outlets (stubouts), providing such utility construction is outside the property line or more than five (5) feet from a building or heavy engineering structure, including the Navajo Indian Reservation.

Modification Record:

No.	Publication Date	Page No.(s)
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	Basic Hourly Rates	Fringe Benefits
CARPENTERS	8.11	.44
CEMENT MASONS	8.18	.26
ELECTRICIANS	17.00	2.35
IRONWORKERS:		
Reinforcing	7.96	.50
Structural	9.36	1.29
LABORERS:		
Group I	5.70	.35
Group II	6.00	.35
Group III	6.40	.35
COMMERCIAL LINE WORK:		
AREA A:		
Linemen - Technicians:		
Zone I	17.70	2.70+ 3.75%
Zone II	19.29	2.70+ 3.75%
Zone III	20.36	2.70+ 3.75%
Zone IV	22.30	2.70+ 3.75%
Cable Splicers:		
Zone I	19.47	2.70+ 3.75%
Zone II	21.06	2.70+ 3.75%
Zone III	22.13	2.70+ 3.75%
Zone IV	24.07	2.70+ 3.75%
Equipment Op. (includes heli- copter op.):		
Zone I	16.81	2.70+ 3.75%
Zone II	18.40	2.70+ 3.75%
Zone III	19.47	2.70+ 3.75%
Zone IV	21.41	2.70+ 3.75%
Equipment mechanic (include heli- copter mech.):		
Zone I	16.81	2.70+ 3.75%
Zone II	18.40	2.70+ 3.75%
Zone III	19.47	2.70+ 3.75%
Zone IV	21.41	2.70+ 3.75%
Powderman:		
Zone I	15.40	2.70+ 3.75%
Zone II	16.99	2.70+ 3.75%
Zone III	18.06	2.70+ 3.75%
Zone IV	20.00	2.70+ 3.75%
Groundman - Jackhammer op.:		
Zone I	12.57	2.70+ 3.75%
Zone II	14.16	2.70+ 3.75%
Zone III	15.23	2.70+ 3.75%
Zone IV	17.17	2.70+ 3.75%
AREA B:		
Linemen - Technicians:		
Zone I	15.05	1.80+ 3.75%
Zone II	17.03	1.80+ 3.75%
Cable Splicers:		
Zone I	15.49	1.80+ 3.75%
Zone II	17.54	1.80+ 3.75%
Equipment mechanic (include heli- copter mechanic:		

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Zone I	12.83	1.80+	3.75%
Zone II	14.53	1.80+	3.75%
Powderman:			
Zone I	12.39	1.80+	3.75%
Zone II	14.03	1.80+	3.75%
Jackhammer - Groundman:			
Zone I	10.47	1.80+	3.75%
Zone II	11.86	1.80+	3.75%
AREA C:			
Linemen - Technicians:			
Zone I	16.45	2.25+	3.75%
Zone II	16.90	2.25+	3.75%
Zone III	17.05	2.25+	3.75%
Zone IV	17.30	2.25+	3.75%
Cable Splicers:			
Zone I	16.78	2.25+	3.75%
Zone II	17.23	2.25+	3.75%
Zone III	17.38	2.25+	3.75%
Zone IV	17.63	2.25+	3.75%
Equipment Op. & mechanics (includes helicopter op. & mechanics):			
Zone I	14.31	2.25+	3.75%
Zone II	14.76	2.25+	3.75%
Zone III	14.91	2.25+	3.75%
Zone IV	15.16	2.25+	3.75%
Powderman:			
Zone I	13.82	2.25+	3.75%
Zone II	14.27	2.25+	3.75%
Zone III	14.42	2.25+	3.75%
Zone IV	14.67	2.25+	3.75%
Groundman - Jackhammer:			
Zone I	11.68	2.25+	3.75%
Zone II	12.13	2.25+	3.75%
Zone III	12.28	2.25+	3.75%
Zone IV	12.53	2.25+	3.75%
LINE CONSTRUCTION - UTILITY FOR ELEC- TRIC & TELEPHONE UTILITIES, REA CO-OPS, RAILROADS & MUNICIPALITIES:			
Linemen-Technicians	17.52	2.95+	3.75%
Cable Splicers	18.75	2.95+	3.75%
Equipment op. & mechanic (includes helicopter op. & helicopter mechanic)	15.24	2.95+	3.75%
Powderman	14.72	2.95+	3.75%
Groundman-Jackhammer	11.91	2.95+	3.75%
PAINTERS:			
Brush	8.64	.91	
Spray	9.09	.20	
PLUMBERS:			
AREA I	17.44	4.99	
Specific Area	18.24	4.99	
All irrigation & lawn sprinkler work	7.80	3.09	
POWER EQUIPMENT OPERATORS:			
GROUP I	8.06	.26	
GROUP II	8.26	.26	
GROUP III	8.84	.26	
GROUP IV	8.86	.26	
GROUP V	8.86	.26	

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GROUP VI	9.01	.26
GROUP VII	9.06	.26
GROUP VIII	9.21	.26
GROUP IX	9.71	.26
GROUP X	10.51	.26
TRUCK DRIVERS:		
Pick-up truck 3/4 ton or under; ware-		
houseman; dump truck under 8 cu. yds.;		
flat bed, 1 1/2 ton or under	6.75	.26
Dump truck, 8 to 16 cu. yds.; flat		
bed over 1 1/2 ton	6.95	.26
Distributor (asphalt); transit-mix;		
lowboy, light equipment; off-highway		
hauler; dump truck over 16 cu. yds.;		
trailer semi-trailer dump	7.15	.26
Diesel-powered transport; lowboy		
heavy equipment	7.35	.26

WELDERS -- Receive rate prescribed for craft performing operation to which welding is incidental.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR, 5.5 (a) (1) (ii)).

CLASSIFICATION AREA AND ZONE DEFINITIONS

LABORERS:

GROUP I - Common laborer; carpenter tender; concrete buggy op. (hand); concrete workers

GROUP II - Air & power tool man; asphalt heaterman; asphalt jointman; asphalt raker; batching plant scaleman; tenders (to cement mason & plasterer); chain sawman; concrete power buggyman; concrete touchup man; concrete sawman; curbing machine, asphalt or cement; cutting torchman; metal form setter-road; grade setter; hod carrier; mortar mixer & mason tender; powderman or blaster tender; sandblaster; scaler; vibratorman (hand type); vibrator compactor (hand type); wagon air tract, drill & diamond driller (outside) & tender

GROUP III - Guniting pumpcrete & nozzle man; multiplate setter; manhole builder; pipelayer; powderman-blaster-make-up

COMMERCIAL LINE WORK (excluding work done for electric & telephone utilities, REA co-ops, railroad & municipalities):

AREA A - Also applies to switching stations & substations adjacent to power plants, Catron, Chaves, Cibola, Colfax, Curry, Debaca, Grant, Guadalupe, Harding, Lincoln, McKinley, Mora, Quay, Rio Arriba, Roosevelt, Sandoval, San Juan, San Miguel, Sierra, Socorro, Taos, Torrance, Union, Valencia, and those portions of White Sands Missile Range and Fort Bliss in Otero County, New Mexico

ZONE 1 - Cities & Towns Basing Points & Miles from Main Post Office

Roswell 12 miles

Ruidoso - 12 miles

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Las Vegas - 8 miles
 Farmington - 6 miles
 Raton - 6 miles
 Tucumcari - 6 miles
 Aztec - 6 miles

Portales - 12 miles
 Carrizozo - 12 miles
 Clovis - 12 miles
 Gallup - 10 miles

ZONE II - Extending up to 20 miles beyond Zone I, EXCEPT ALBUQUERQUE, rates per hour shall be increased by 9% of the journeyman rate of Zone I

ZONE III - Extending up to 30 miles beyond Zone I, EXCEPT ALBUQUERQUE rates per hour shall be increased by 15% of the journeyman rate of Zone I

ZONE IV - Anything beyond 30 miles from Zone I, EXCEPT ALBUQUERQUE, rates per hour shall be increased by 26% of the journeyman rate for Zone I

For establishing the outlying free zones from the Albuquerque free zone only, Zone II shall extend up to 10 miles beyond Zone I, Zone III shall extend up to 20 miles beyond Zone I and Zone IV anything beyond 20 miles from Zone I

AREA B - Applies to switching stations & substations adjacent to power plants in Zone I & Zone II in Luna, Dona Ana, Otero & Hildalgo Cos., exclusive of those portions of White Sands Missile Range and Fort Bliss in Dona Ana County, New Mexico.

ZONE I - that area within 25 miles radius from the downtown Post Office of El Paso, Texas. Fort Bliss & Biggs Field; the area within a 5 mile radius of any city, town or municipality within which an employer establishes or maintains his place of business; the area within 10 mile radius from the Post Office in Alamogordo, New Mexico.

ZONE II - all other areas of the jurisdiction except those specified in Zone I

AREA C - applies to switching stations adjacent to power plants in Eddy & Lea Cos.; the following zones listed shall be designated from the Main Post Office of Artesia, Carlsbad, Hobbs & Lovington:

Zone I - 0 to 12 miles	Zone II - 12 to 22 miles
Zone III - 22 to 40 miles	Zone IV - 40 miles & beyond

PLUMBERS & PIPEFITTERS AREA DEFINITIONS:

AREA I:

Albuquerque, Alamogordo, Anthony, Belen, Bernalillo, Clovis, Deming, Espanola, Farmington, Gallup, Grant, Las Cruces, Las Vegas, Lordsburg, Los Lunas, Portales, Raton Rio Rancho, Roswell, Ruidoso, Santa Fe, Silver City, Santa Rosa, Socorro, Taos, Tucumcari, Truth or Consequence, Artesia, Carlsbad, Hobbs, and Lovington.

Specific Area:

Los Alamos, White Rock, South Mesa, McGregor Range, White Sands Missile Range and/or Proving Grounds.

POWER EQUIPMENT OPERATORS

GROUP I - Concrete paving curing machine

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GROUP II - Belt type conveyors (material & concrete); broom (self-propelled); fork lift; grease truck op.; head oiler; hydro lift; tractor (under 50 drawbar HP with or without attachment); industrial locomotive brakeman; front end loader (2 CY or less); fireman; oiler; screedman; roller (pull type); mulching machine; roller (self-propelled)

GROUP III - Concrete paving form grader; concrete paving gang vibrator; concrete paving joint or saw machine; concrete paving subgrader; tractor with backhoe attachment; subgrade or base finisher; power plant (electric, general or welding machine)

GROUP IV - Bulldozer (including self-propelled roller with dozer attachment; batch or continuous mix plant (concrete soil-cement or asphalt); roller (steel wheel); front end loader (2 CY thru 10 CY); scraper; motor grader

GROUP V - Asphalt distributor; asphalt paving or laydown machine; asphalt retort heater; mixer, heavy duty, asphalt or soil cement; trenching machine; clam type shaftmucker; backhoe, clamshell, dragline, gradall, shovel (under 3/4 CY); elevating grader or belt loader; cranes (crawler or mobile) under 20 ton; air compressor (300 CFM & over); crushing, screening & washing plants; drilling machine (cable, core or rotary); mixer, concrete (1 CY & less); pump (6" intake or over); winch truck; hoist (1 drum); industrial locomotive motorman; lumber stacker; tractor (50 drawbar HP or over)

GROUP VI - Concrete paver mixer; hoist (2 drum & over); side boom; traveling crane; piledriver; backhoe, clamshell, dragline, gradall, shovel (3/4 CY to 3 CY); cranes (crawler or mobile) 20 ton to 40 ton; front end loader (over 10 CY); mixer concrete (over 1 CY); mechanic and/or welder

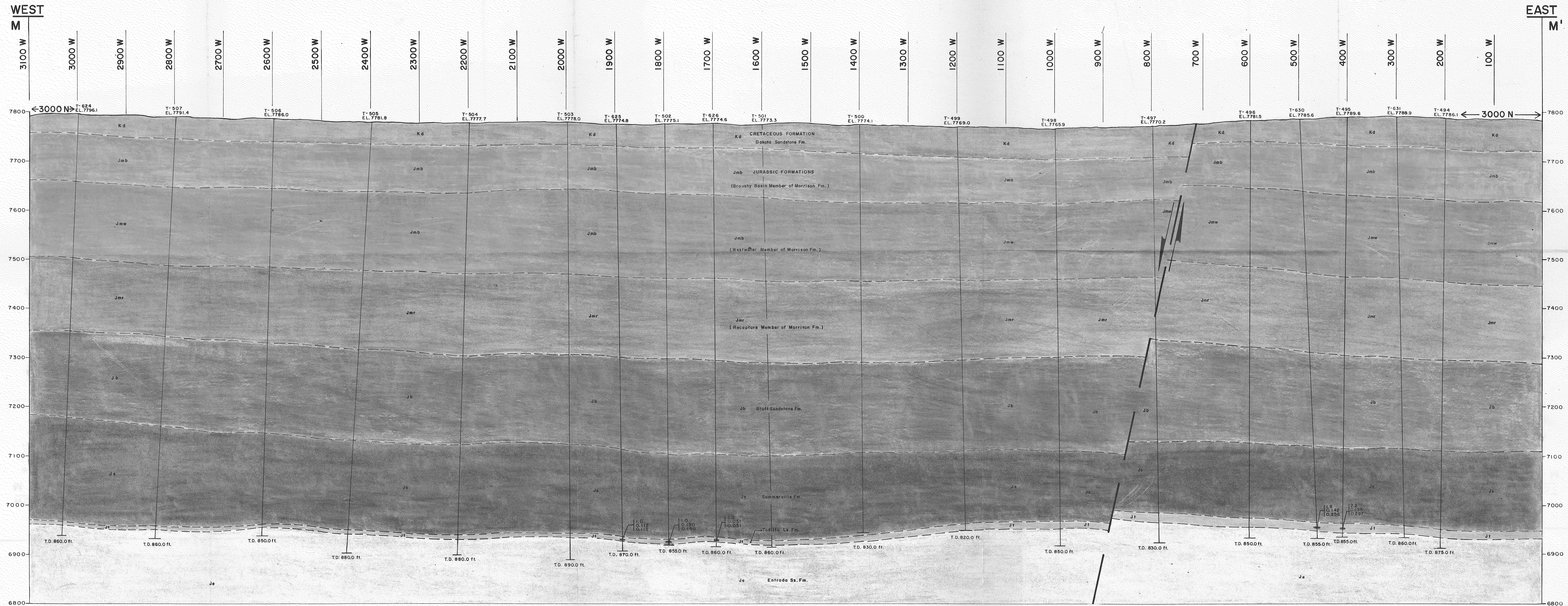
GROUP VII - Concrete slip-form paving machine; concrete paving finishing machine; concrete paving longitudinal float; gunite machines; refrigerator; jumbo form or drilling; stage; slusher; concrete paving spreader; pumpcrete machine; grout pump op.

GROUP VIII - Mine hoist; bulldozer (multiple units); scraper (multiple units); mucking machines; backhoe, clamshell, dragline, gradall, shovel (over 3 CY); cranes (crawler or mobile)

GROUP IX - Belt loader (CMI type) op.; derrick cableway

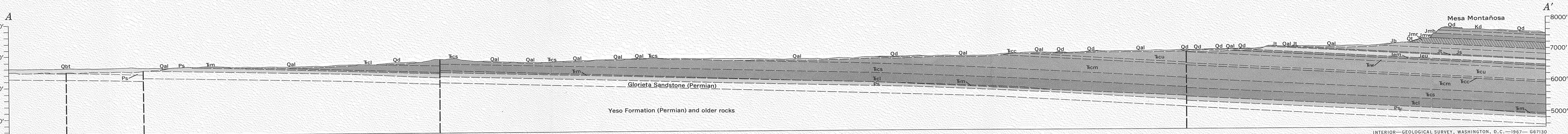
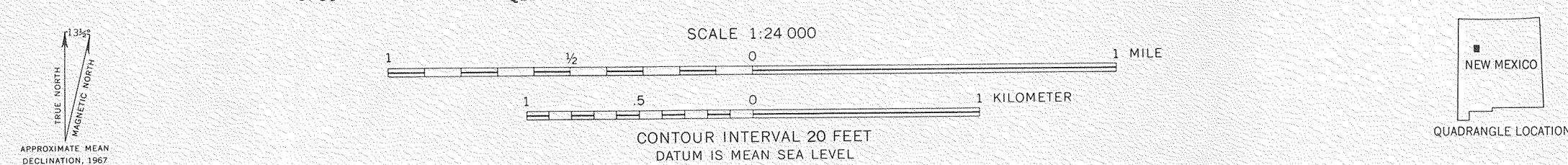
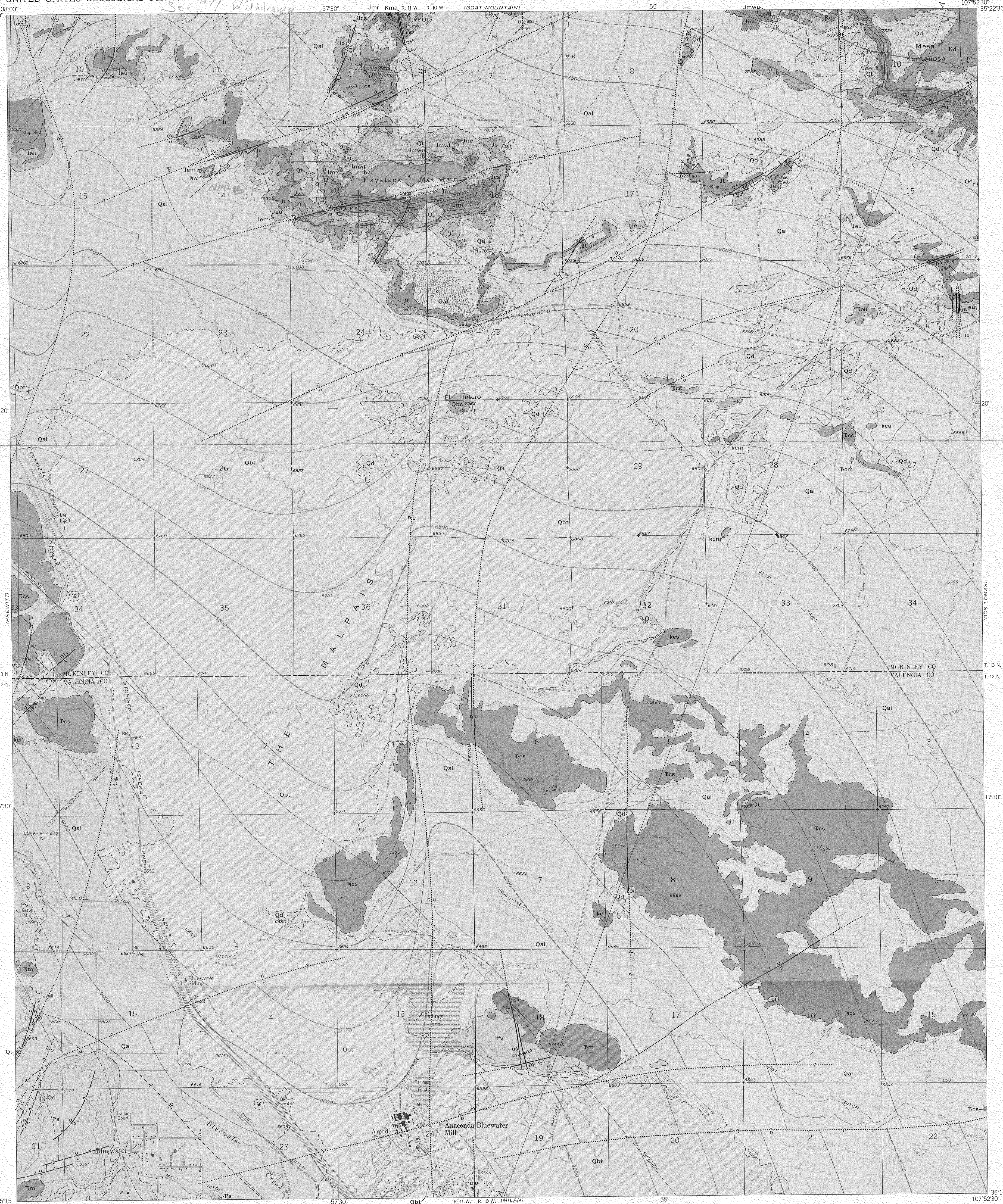
GROUP X - Pipemobile op., mole op.

SEC. 13, T.13N, R.11W.



GEOLOGICAL CROSS SECTION M-M'
HAYSTACK PROJECT-MCKINLEY CO., N.M.
GEOLOGY BY T.A. SCHACK

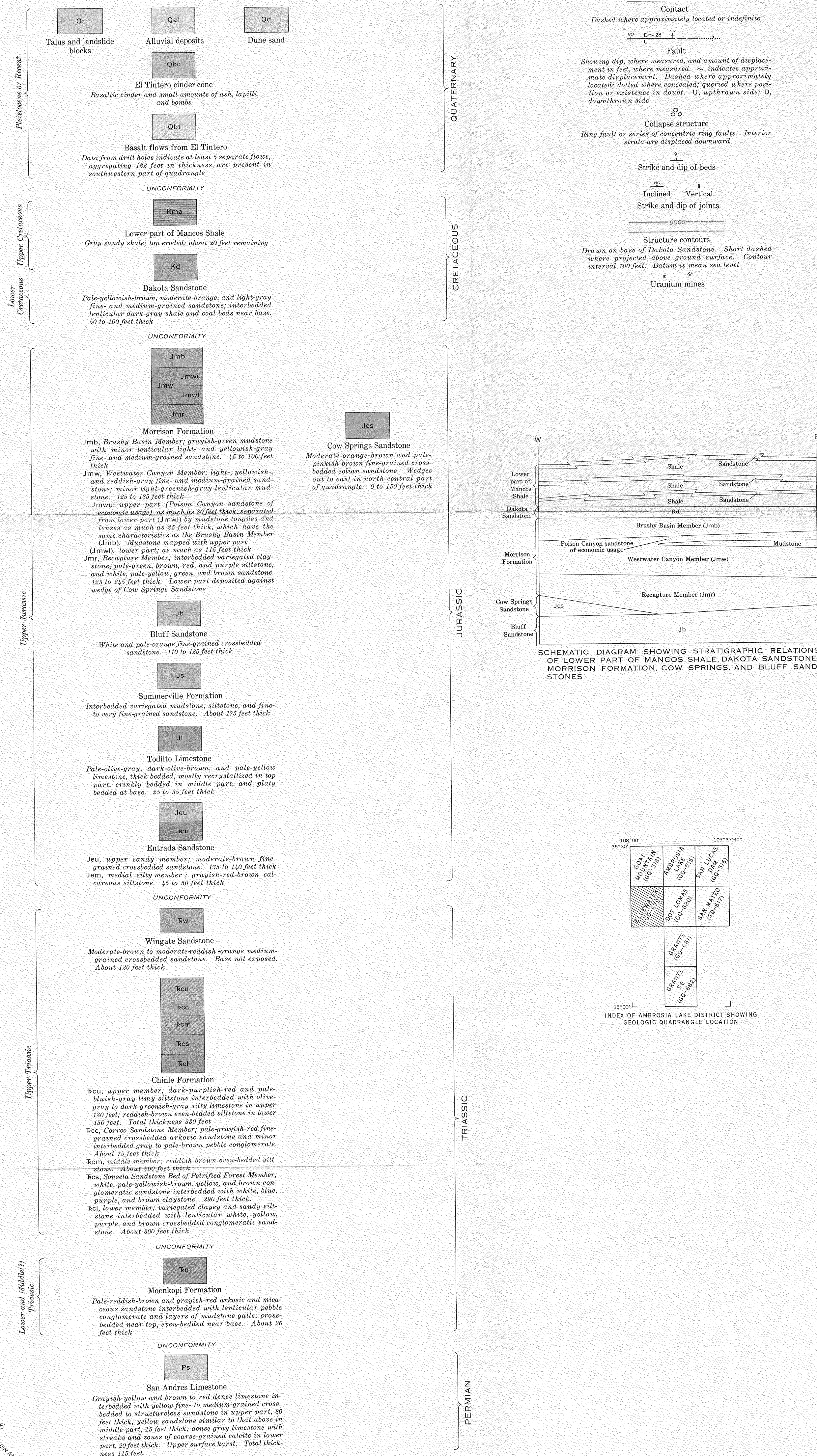
Vertical and Horizontal Scales: 1"=100'
Looking North

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEYPREPARED IN COOPERATION WITH THE
U.S. ATOMIC ENERGY COMMISSION

GEOLOGIC MAP OF THE BLUEWATER QUADRANGLE, VALENCIA AND MCKINLEY COUNTIES, NEW MEXICO

By
Robert E. Thaden and Earl J. Ostling
1967GEOLOGIC QUADRANGLE MAP
BLUEWATER QUADRANGLE, NEW MEXICO
QQ-679

EXPLANATION

SCHEMATIC DIAGRAM SHOWING STRATIGRAPHIC RELATIONS
OF LOWER PART OF MANCOS SHALE, DAKOTA SANDSTONE,
MORRISON FORMATION, COW SPRINGS, AND BLUFF SAND-
STONESINDEX OF AMBROSIA LAKE DISTRICT SHOWING
GEOLOGIC QUADRANGLE LOCATION

DRAFT AGENDA
MEETING
ABANDONED URANIUM MINES
NAVAJO LANDS, NEW MEXICO
CIBOLA CONVENTION AUTHORITY
515 W. HIGH
GRANTS, NEW MEXICO
(505) 285-4625
JUNE 3, 1991

9:00 a.m. Introductions - DOI

9:10 a.m. Discussion of the issue and purpose of field
 inspection - DOI/EPA

10:00 a.m. Depart Grants, NM - Inspection of mine areas.
 (Haystack Mountain Area)

LUNCH (On your own)

2:00 p.m Reconvene Meeting - Grants
 Discussion of the following - DOI/EPA

 a. Highlights of Inspection.

 b. Time critical actions.

 c. Time frame for actions.

 d. Cooperative Agreements required.

 e. Any remaining issues.

4:15 p.m. Wrap Up.

4:30 p.m. Adjourn.

MEETING ATTENDANCE. ABANDONED URANIUM MINES GRANTS N.M.

6/3/91

NAME.	AGENCY	PHONE.
JIM OLSEN	BLM	988 6109
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VINCENT F. TONE	CHEN Nuclear	303-248-6464
THOMAS O'HARE	OFF OF THE SOLICITOR	602-871-5151 FTS-474-5117
PATTY McLEAN	BLM	505-761-8700
Glenn Sekavec	DOI	505-766-3565
* Jerry DeGroat	BIA, ENA	505-786-6122
Wilfred G. Bowman	BIA, ENA	505-786-6101
Joanne Manygoats	Navajo Nation	602/871-6284
Allen Sodik	BIA - AAO	505-766-3167
Marvin Sarracino	Jack Pite Reclamation Project	505-552-6011
ROSE DAWYENIE	BIA ENV. QUALITY	FTS 571-9285



TO: *Vinc Jmc*

United States Department of the Interior



OFFICE OF THE SECRETARY
OFFICE OF ENVIRONMENTAL AFFAIRS
POST OFFICE BOX 649
ALBUQUERQUE, NEW MEXICO 87103
May 24, 1991

Received DOE
Grand Jct. Field Office

MAY 28 1991

Memorandum

To: Walter Mills, BIA, Navajo
Joanne Manygoats, Navajo Nation, Window Rock
David Sitzler, BLM, Albuquerque
Bernard Freeman, OSM, Albuquerque
Thomas O'Hare, SOL, Window Rock
Charles Dowell, IHS, Window Rock
Bob Ivey, DOE, Grand Junction
Rob Bornstein (H-8-3), EPA, San Francisco
Bill Nelson, ATSDR, San Francisco

From: Raymond P. Churan

Subject: Meeting on Abandoned Uranium Mines, Navajo Lands,
June 3, 1991, Grants, New Mexico

As the designated "Points of Contact" for your respective bureaus and agencies pertaining to this issue we are confirming, with this memorandum, earlier phone calls to each of your office's concerning the subject meeting.

The meeting will be held on June 3, 1991 at the Cibola Convention Authority, 515 W. High, Grants, New Mexico. A set of directions is attached.

The purpose of this meeting is to (1) visually inspect the problem mine areas included in the ATSDR Public Health Advisory, (2) discuss the latest EPA test results, (3) determine the time critical actions that could be taken by EPA to address the health and safety concerns and (4) explore cooperative Federal agreements in accomplishing these actions. A draft agenda for this meeting is attached.

Raymond P. Churan
Raymond P. Churan

Attachments (2)

cc:
Director, OEA, Washington, DC w/attach
Regional Environmental Officer, OEA, San Francisco w/attach
Regional Environmental Officer, OEA, Denver w/attach
Regional Solicitor, Tulsa
Hazardous Material Coordinator (NM 931), BLM, Santa Fe

RECEIVED
MAY 29 1991

'F TONC

DRAFT AGENDA
MEETING
ABANDONED URANIUM MINES
NAVAJO LANDS, NEW MEXICO
CIBOLA CONVENTION AUTHORITY
515 W. HIGH
GRANTS, NEW MEXICO
(505) 285-4625
JUNE 3, 1991

9:00 a.m. Introductions - DOI

9:10 a.m. Discussion of the issue and purpose of field inspection - DOI/EPA

10:00 a.m. Depart Grants, NM - Inspection of mine areas. (Haystack Mountain Area)

LUNCH (On your own)

2:00 p.m. Reconvene Meeting - Grants
Discussion of the following - DOI/EPA

- a. Highlights of Inspection.
- b. Time critical actions.
- c. Time frame for actions.
- d. Cooperative Agreements required.
- e. Any remaining issues.

4:15 p.m. Wrap Up.

4:30 p.m. Adjourn.

Meeting
Abandoned Uranium Mines
Navajo Lands, New Mexico

Directions to Cibola Convention Authority, 515 W. High, Grants,
New Mexico (505) 285-4625

From Albuquerque - West on I-40 to Grants Exit 85. When you exit
you will be on Santa Fe Avenue - Go to Iron Street (mid-town) you
will see the mining museum - turn right - you will then see the
convention building - it is a white mission style building.

Mines Under RERA

Sustained

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Could be Under the Water

States To Recover

Reclaim!

411/100

18 Mo - 1/100

3 p/100

Exemption 5

Exemption 5

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Exemption 5

April 22, 1991

Health Physicist
Federal Facilities Activity, OD, DHAC, ATSDR

Health Consultation: Navajo-Brown Vandever and Navajo-Desiderio
Uranium Mining areas, Bluewater, New Mexico.

William Nelson, ATSDR, Region IX
Through: Director, DHAC, ATSDR_____
Acting Chief, ERCB, DHAC, ATSDR_____

BACKGROUND AND STATEMENT OF ISSUES

On November 21, 1990, the Agency for Toxic Substances and Disease Registry (ATSDR) released a Public Health Advisory notifying the Environmental Protection Agency (EPA) that conditions existing at several abandoned uranium mining areas in new Mexico posed a potential significant health hazard. These adverse conditions include the presence of radioactive materials, physical hazards, and heavy metals on or near residential areas where approximately 500 people reside including many children. One result of the Public Health Advisory was that EPA Region IX and the EPA Las Vegas facility collected soil, water, and air samples from the sites. These were analyzed for radioactive materials and heavy metals.

Following the collection and analysis of these samples, EPA Region IX requested the assistance of ATSDR (see attachment) to further evaluate the acute and chronic radiological hazard posed to those individuals living on or near the sites discussed in the Public Health Advisory. The EPA also requested that ATSDR assist in the estimation of the risk for those individuals living near these sites based on a two year exposure, for those individuals living near these sites.

The EPA collected soil, water, and air samples at the Brown Vandever (BV) mine area and the Desiderio (ND) mine areas. Each area was divided into sections and subdivided into stations. Using standard radiation detection equipment, a background reading for each area was measured and external environmental radiation levels were measured for each station within areas. In the BV area, the net (background subtracted) radiation levels ranged from three microrentgens per hour ($\mu\text{R/h}$) to over 750 $\mu\text{R/h}$ at waist level. On contact with the ground, the maximum level exceeded 1,225 $\mu\text{R/h}$. At the ND areas, the net radiation levels ranged from background to over 375 $\mu\text{R/h}$ at waist level and over 850 $\mu\text{R/h}$ on contact. The waist level measurements are indicative of human exposure levels, whereas, the contact measurements suggest the emission rate of the radioactive materials.

Page 2 - William Nelson

Potable water samples were obtained from taps at both locations, a livestock well, and the nearby preschool water supply well. All amounts of detected radionuclides were below the Primary Drinking Water Standards for radioactive materials.

Soil samples collected and analyzed for both radium (Ra-226/228) and uranium isotopes (U-233/234/235/238) showed that there were high levels of these radionuclides in the soils. The maximum levels of radioisotopes detected in surface soils (top 15 centimeters) at the BV area were: for radium in excess of 260 picocuries per gram soil (pCi/g) and for uranium species more than 300 pCi/g. At the ND area, the maximum levels of radium detected in surface soils exceeded 30 pCi/g and for uranium, the maximum level exceeded 390 pCi/g.

Radon (Rn-222) flux measurements from the waste piles were also measured at several stations within the BV area. These results showed that the maximum emission rate of radon was 67 pCi per square meter per second. No measurements from the ND area were supplied to ATSDR.

Samples were also collected to determine the heavy metal content of soils and water as this was a concern of ATSDR in the Public Health Advisory. The data supplied to ATSDR suggest all concentrations in soil and water were below levels of concern.

The presence of physical hazards existing at these sites was also reported by the EPA, confirming earlier ATSDR concerns. The physical hazards included open mine shafts, ventilation shafts, mining pits, and unstable structures.

DOCUMENTS AND INFORMATION REVIEWED

The material reviewed for the preparation of this consultation included the ATSDR Public Health Advisory, the Code of Federal Regulations (CFR), the National Council on Radiation Protection and Measurements (NCRP) Report 91 on the Recommendations on Limits for Exposure to Ionizing Radiation, the National Academy of Sciences BEIR V report, and sampling results from the EPA dated January 29, 1991.

DISCUSSION

ATSDR reviewed these recent data and correlated the gamma radiation levels found by the EPA at the sites with the levels believed to exist at the time the Public Health Advisory was developed. These latest results verified ATSDR's concerns as expressed in the Public Health Advisory. Indeed, in some locations measured levels were twice the 500 μ R/h that ATSDR estimated could be present.

The radiation exposure levels in selected areas of these sites may represent an acute hazard to those individuals that might frequent

Page 3 - William Nelson

such areas. Because of the physical nature of gamma radiation, factors such as proximity to the radioactive areas and the time spent in the areas, will affect the magnitude of exposure and potential health effects. For example, if an individual is 10 feet from a pile for an hour and another individual is 20 feet from the same pile for an hour, the individual 20 feet from the pile could receive a dose one fourth that of the other individual. Therefore, the more time spent closer to these waste piles or other areas with elevated radiation levels, the associated health hazards may become more of an acute than a chronic health concern. This would especially be true for local residents who frequently work or play among the piles.

According to the NCRP, the continuous or frequent annual external radiation exposure to a population should not exceed 100 millirem per year (mrem/y); the limit of 500 mrem/y should be applied for an infrequent annual exposure. If the proposed limit of 100 mrem/y for the public is used for these sites, the annual radiation exposure limit at the Navajo sites in question would easily be exceeded during a year.

Using the above criteria, the radiation exposure rates near the subject residential areas would be considered as representative of a chronic, low level radiation exposure. There are also data to suggest that an imminent radiological health hazard exists to individuals who might frequent the waste piles. In the Public Health Advisory, ATSDR defined an imminent radiation health hazard based on 10 CFR 20.104-105. The levels measured at the waste piles at these sites could exceed these requirements. Additional support for classifying these sites as an imminent public health threat can be found in 40 CFR 190.10 which states that the annual radiation exposure to the entire body should not exceed 25 mrem per year. The 40 CFR 190.10 exposure limit includes releases of radioactive materials, except radon and its decay products, from all phases of operations using uranium, including mining and milling operations. Because some piles have emission rates of approximately one mR/h, which is nearly equivalent to one mrem/h, the 40 CFR 190.10 maximum allowable annual exposure limit could be reached after several short periods of exposure.

During the visits ATSDR has made to these particular sites, uranium ore bearing materials were observed both next to residential areas and in structural components of the residences. Because ATSDR did not receive any sampling data or monitoring data concerning Rn-222 levels in residential areas, the extent of any exposure from the radon cannot adequately be determined. Such data would be required to complete the evaluation of the public health hazards.

EPA Region IX also requested that ATSDR determine if the risk of exposure exceeded the 1×10^{-4} risk level as described in the National Contingency Plan for removal action or remedial action at a site. Because this request involves risk analysis and risk assessment for

Page 4 - William Nelson

the purposes of remediation and clean-up, it is the purview of the EPA, not ATSDR, to address risk management issues; therefore, ATSDR cannot respond directly to this request. However, ATSDR refers the EPA Region IX to the ATSDR Health Advisory and the discussion of the BEIR V report that discusses the risk of excess cancer mortality for males and females exposed to ionizing radiation at a rate of 100 milliroentgens per year (mR/y). These risks are for a lifetime exposure of 70 years.

The Navajo people do not tend to be a migratory population but, have a tendency to remain close to their ancestral lands and homes. Thus, long-term exposure to varying levels of radiation as present at these locations must be considered, not the two year exposure as discussed in the EPA letter of January 29, 1991. The exposures to these levels of ionizing radiation have been occurring for much longer than the two years it would take for a remedial removal action to take place.

CONCLUSIONS

Based on the available data and interpretation of existing Federal Guidelines and recommendations of the NCRP, ATSDR concludes that:

1. Radiation exposure at these sites could result in adverse health effects depending on the amount of time spent in radioactively contaminated areas. The residential areas appear to be relatively safe; whereas, if much time is spent in areas containing the waste piles, an imminent health problem could result;
2. The soil sampling data indicated that the levels of radium-226 in the top 15 cm of soils exceed the regulatory limits (40 CFR 192);
3. The data indicate that radon-222 (Rn-222) emission rates from the abandoned waste piles exceed the guidelines of 20 pCi per square meter per second (40 CFR 192);
4. Heavy metals do not pose a health hazard to the residents of these areas as initially believed in the Public Health Advisory;
5. The physical hazards at the site still pose a public health concern and have not been addressed with regards to site safety both for residents and potential workers at these sites.

RECOMMENDATIONS

Because of the nature of gamma radiation, simple but effective measures can be implemented to reduce the health hazards. Since the levels of radiation detected are a public health hazard and the

Page 5 - William Nelson

physical hazards are still present at these sites, ATSDR is making the following recommendations to protect the public health at the Brown Vandever and Desiderio mining areas.

1. Although the sampling procedures sufficiently determined the levels of radioactive materials in the areas of the mine wastes, ATSDR feels that additional air samples for Rn-222 need to be collected in the residential areas. The Rn-222 data should be collected, analyzed, and submitted to ATSDR as quickly as time permits.
2. Because of the physical nature of the contaminants at these sites, it would be prudent to restrict site access by an appropriate and approved method.
3. An additional site safety plan for residents should be in place to address the radioactive and physical hazards at this site besides the site safety plan in place for on-site workers.
4. The recommendations of ATSDR as listed in the Public Health Advisory are still applicable to this site including the possibility of exposure studies of local residents.

Paul A. Charp, Ph.D.

Attachment

cc: Dr. M. Lichtveld

ATSDR:DHAC:ERCB:TSS:FF:PCharp:mrg:4/22/91:0615

NOV 21 1990

The Honorable William K. Reilly
Administrator
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

Dear Mr. Reilly:

With this letter, we are enclosing the Public Health Advisory for radiation exposure, potential exposure to heavy metals, and physical hazards associated with the Navajo-Brown Vandever and Navajo-Desiderio Uranium Mining Areas near Bluewater, New Mexico.

The Agency for Toxic Substances and Disease Registry (ATSDR) has evaluated the available environmental information for the inoperative Navajo-Brown Vandever and Navajo-Desiderio Uranium Mining Areas. As a result of this evaluation, we consider the sites a potentially serious threat to human health because of the presence of uranium mine wastes, associated radon emission, and the potential presence of heavy metals in residential areas. These areas also contain many readily accessible mine shafts and open-pit mining areas. In accordance with Section 104(i)(6)(H) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), ATSDR is recommending that you evaluate the sites for inclusion on the National Priorities List.

In the Public Health Advisory, ATSDR recommends the following actions:

1. The Environmental Protection Agency (EPA) should initiate data collection to characterize the contamination and its extent.
2. If the data being collected indicate that residents face an imminent radiation health hazard, immediate action should be taken to mitigate the hazard. If appropriate, this action could include the temporary relocation of affected residents until the hazard has been removed or mitigated.
3. Public water supplies and private wells in the area should be sampled immediately for radioactive materials and heavy metals.

Page 2 - The Honorable William K. Reilly

The enclosed Public Health Advisory expresses our concerns and addresses measures to eliminate human health hazards. The Assistant Administrator of ATSDR, Dr. Barry L. Johnson, has notified the EPA Region IX Administrator, the New Mexico State Department of Health, and the Indian Health Service about this Advisory.

Sincerely,

William L. Roper, M.D., M.P.H.
Administrator

Enclosure

cc:

EPA Administrator, Region IX
New Mexico State Department of Health
Indian Health Service
Indian Health Service, Navahoe Area Office
PHS Region VI
ATSDR Region VI
ATSDR Region IX

SENT BY FAX 10/21/90 3:30PM

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AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY
PUBLIC HEALTH ADVISORY

NAVAJO-BROWN VANDEVER
AND
NAVAJO-DESIDERIO URANIUM MINING AREAS
NAVAJO NATION
BLUEWATER, NEW MEXICO

November 21, 1990

Statement of Purpose

This Public Health Advisory is issued to inform the Environmental Protection Agency (EPA), the Navajo Nation, the Indian Health Service (IHS), the Bureau of Indian Affairs (BIA), the State of New Mexico, and the public of a potential significant environmental hazard to human health near Bluewater, New Mexico. After evaluating available information (1,2) and visiting the area, the Agency for Toxic Substances and Disease Registry (ATSDR) has determined that this Public Health Advisory is warranted for the Navajo-Brown Vandever (N-BV) and Navajo-Desiderio (N-D) Uranium Mining Areas. The presence of uranium-containing radioactive mine wastes, areas potentially contaminated with heavy metals, and many physical hazards form the basis of this Advisory. Because of these potential hazards to human health, the ATSDR is recommending that these sites be evaluated for inclusion on the National Priorities List.

At the request of the EPA, Region VI, and the Navajo Superfund Office (NSO), the ATSDR initiated preliminary investigations of the radiological, chemical, and physical hazards associated with the N-BV and N-D uranium mines. These sites are not currently on the National Priorities List, but the NSO and the EPA are currently developing Preliminary Site Assessments.

Two site visits by the ATSDR staff were made to the Navajo-Brown Vandever and Navajo-Desiderio Uranium Mining Areas. Field monitoring data were taken at the time of the visits. The ATSDR has concluded, based on the site visits, the data acquired during the visits, and the evaluation of other available information, that radioactive materials potentially hazardous to human health may be present at these sites. These hazardous materials include uranium-containing mine wastes with radiation levels potentially hazardous to human health, areas potentially contaminated with heavy metals at soil concentrations potentially hazardous to human health, and many physical hazards of public health concern. This finding has led to the issuance of this Public Health Advisory.

Background

The N-BV and N-D sites are in Bluewater, about 4 and 9 miles east of Prewitt, New Mexico, respectively (1,2). Both areas are in the Ambrosia Lake subdistrict of the Grants Uranium Mining District. Access to the areas is over improved dirt roads. These mining areas are in agricultural rural settings and adjacent to residential properties. Both mines are located on land owned by the Navajo Nation and held in trust by the Bureau of Indian Affairs, United States Department of Interior. The current owner of the N-BV mine is Mr. Brown Vandever, who lives at the site with his extended family. The owner of the N-D mine is Mrs. Jenny Desiderio, who inherited the mine from her deceased husband and lives on the site with her extended family.

The NSO estimates that at each site there are approximately 65 people, 30 of whom are children. Less than 3 miles from the sites is a preschool with a student enrollment of about 30 children. The NSO also estimates that about 500 persons are potentially impacted by environmental hazards at these sites.

A potable municipal-type water supply system for the area is derived from a well installed by the IHS. The NSO estimates depth of the well is about 1,100 feet. However, the NSO believes that not all residents are on this water system. The wells used by those residences not on the public supply are well systems operated by windmills.

The N-BV area encompasses about 155 acres (1), and the N-D mine covers about 130 acres (2). Within a mile of the N-BV mine is the Navajo-Nanabah Vandever (N-NV) mine site. These sites initially were open-pit mining operations. Besides the open-pit operations, the N-BV area operated as a subsurface mine. The site therefore includes horizontal mine shafts and ventilation shafts, some of which are almost vertical. During the site visits, the ATSDR observed that household wastes had been deposited into some of these shafts. It was apparent that local residents were still using these shafts for solid waste disposal.

Historically, the N-BV mine was operated periodically from 1952 to 1966 by various companies including Santa Fe Uranium, Federal Uranium Mesa Mining Company, and the Cibola Mining Company. During the operations of this mine, conventional mining techniques were used. The ore removed from the mine was believed to be sorted by hand and shipped to regional mills located near Ambrosia Lake or Shiprock, New Mexico, or the Durango, Colorado, areas. In its draft Preliminary Assessment of the site, the NSO documented that over 25,000 tons were removed from the mine. The ore processing produced about 49 tons of uranium oxide (U_3O_8) and over 37 tons of vanadium pentoxide (V_2O_5). Ores not meeting the screening criteria for uranium content were discarded at the mine site. These ores now line the roads leading to the Brown-Vandever residential and mine areas (1).

From 1952 to 1957, the N-D mine was operated by "Sante Fe" (exact name unknown, may not be the same company as previously mentioned) and the Hanosh Mines from Grants, New Mexico. The mining technique involved removing the soil overburden with heavy equipment followed by drilling and blasting the ores loose. The ores then were trucked to area mills for processing. Ores not meeting the minimum requirements for uranium content were disposed of at on-site locations. The NSO estimates that the 11,110 tons of ore removed by this operation contained over 83,000 pounds of U_3O_8 and over 17,500 pounds of V_2O_5 (2).

At both the N-BV and the N-D mines, the physical hazards are of particular concern to the ATSDR because of the number of children known to reside in the areas. The physical hazards observed by ATSDR include both open mine shafts and open pits. Because of the depth of the shafts and the unrestricted access, an inadvertent intruder either entering or falling into the shafts could be difficult to find and rescue.

Explanation of Terms

This document uses terms associated with radioactivity and dose resulting from radiation exposure. These terms are defined here.

curie -- A curie (abbreviated Ci) is the unit used to measure the amount of radioactivity. It is equal to the amount of radioactivity in 1 gram of radium (1 gram = 1/28 ounce or 0.0022046 lb). A picocurie (pCi) is one trillionth of a curie (1×10^{-12}). One trillionth is the same as 1 second in 320 centuries or 1 inch in 16 million miles. Exposure levels of the radioactive gas radon are commonly expressed as picocuries per liter of gas (pCi/L).

roentgen -- A roentgen (abbreviated R) is used to measure exposure to ionizing radiation, such as gamma rays or X-rays. Gamma radiation is energy given off by certain radioactive substances, such as uranium and radium. Basically, a roentgen defines the amount of energy given off by these radioactive substances into the air. An exposure of 1 R = 87.7 rads per 1 gram of air.

rad -- The abbreviation "rad" stands for radiation absorbed dose. It measures how much radiation is absorbed by a material after exposure to radiation. It is equal to 100 ergs of energy per gram of material (an erg measures energy).

rem -- The abbreviation "rem" stands for roentgen equivalent man. It is a function of the radiation absorbed dose (rad) and the type (or quality) of radiation. In terms of radiation quality, gamma rays are the least harmful internally to humans and alpha particles are the most harmful. The effect of 1 rem is approximately the same as that of 1 R of X-ray or gamma ray radiation. A millirem = 1/1-thousandth of a rem, the same as a dollar in \$1,000. A microrem = 1/1-millionth of a rem, the same as 1 minute in 2 years or 1 inch in 16 miles. Throughout the United States, the average natural radiation exposure (called "background levels") is nearly 300 millirems per year. This includes exposure to radon.

Background radiation occurs from natural sources in the earth's crust. Several naturally occurring radioactive materials contribute to this source of radiation. These include, but are not limited to, uranium, thorium, rubidium, and a small percentage of potassium. Other sources contributing to the background include fallout from cosmic radiation, materials made radioactive as a result of interactions with the cosmic radiation, and nuclear weapons testing. A measurement of the background radiation was collected at Prewitt, New Mexico, approximately 3 miles from these sites by the ATSDR and the NSO. Using radiation detectors sensitive to gamma radiation, the background radiation at Prewitt was estimated to be 6 microroentgens per hour (uR/h). This is equivalent to an annual exposure of 53 millirem, not including radon.

Basis for Advisory

During the week of July 24-27, 1990, and November 1, 1990, personnel from ATSDR Headquarters and Regions VI and IX offices toured these sites. Accompanying the ATSDR personnel were representatives of the local Navajo chapter and the NSO. During the visits, radiation readings were collected by both the ATSDR and the NSO. Discussions also were held with officials and members of the Navajo Nation concerning life-styles, populations, health concerns, and land use in these areas.

A. Navajo-Brown Vandever (N-BV) Site

Along the roadbed leading to the Navajo-Brown Vandever site, the area was littered with rocks and ore tailings. Mine tailings from the nearby Nanabah Vandever mine were within 100 feet from the roadbed. These piles were partially overgrown with vegetation. Within the materials along the roadbed, the uranium ores (yellowish material) were clearly visible. Environmental radiation readings along the road, obtained with a calibrated Ludlum Model 19 gamma radiation detector equipped with an NaI(Tl) scintillator, ranged from approximately 50 microroentgens per hour (uR/h) to over 500 uR/h, whereas the naturally occurring background radiation reading was 6 uR/h. The background radiation measurements were obtained in Prewitt, New Mexico, approximately 3 miles from the sites. Radiation monitoring evidence also suggested that radioactive material had migrated off-site because of both wind-borne distribution and surface runoff during seasonal rains. Additional radiation monitoring indicated that some residential structures contained radioactive material in the foundations and that radioactive materials were also present within 20 feet of the residential areas.

At the main mine shaft located in the pit-mined area, ore tailings were randomly piled around the site and radiation readings were elevated above background. A horizontal shaft entering the mountain was observed; and during discussions with local residents, it was mentioned that the shaft branches into three sections. Entrance to this mine shaft is not restricted. Vertical ventilation shafts were also observed; one shaft was about 10 degrees from vertical. A small shack was constructed over this

ventilation shaft, however, access to the shaft was not effectively restricted. Located near the residential areas were open adits (shafts) being used as solid waste disposal areas by the local residents. These adits may run at least 300 feet in length or depth. The residential areas are less than 200 feet from several adits, and access to these adits is also unrestricted.

Although air sampling data are lacking, because of the uranium content of these mines, the shafts provide an excellent path for the release of radon, a naturally occurring by-product of uranium decay. It is reasonable to infer that the release of radon from these mines could elevate ambient radon to levels potentially hazardous to human health at this site.

During mining operations, analysis of the ores indicated the presence of heavy metals. These included vanadium, arsenic, barium, chromium, magnesium, manganese, strontium, titanium, and zirconium. Leaching may have occurred from these ores; however, no analyses of environmental samples are available to verify the presence of these contaminants. Although recent sampling information is lacking, the potential exists for humans to be exposed to these contaminants through ingestion or inhalation.

B. Navajo-Desiderio (N-D) Site

The Navajo-Desiderio mine is a series of open-pit areas of approximately 30 to 50 feet in depth and of varying lengths. The radiation readings at this site were about 50 uR/h. No restricted access to the pits was observed during the site visit; children play and livestock graze freely in the area, and residential areas are within 100 yards of the pits.

Through a Navajo interpreter, the owner of the mine, Mrs. Jenny Desiderio, informed us that her grandson fell into one of the pits during a sledding accident. The child, who reportedly suffered brain damage, died a few years after the accident. According to Mrs. Desiderio, at least 18 livestock died after ingesting contaminated rainwater that reportedly collects in the pits. Whether the dead animals were examined by a veterinarian is not known. Although sampling data are lacking, the NSO officials believe the animals may have died after ingesting heavy metals which may have leached from the ores into the pit areas.

C. Discussion of Site-related Radiological Contaminants

Of the verified contaminants in these areas, those of concern are uranium and a member of its decay series, radon. Of the naturally occurring isotopes of uranium, uranium-238 (U-238) is the most abundant, present at concentrations greater than 99 percent. The primary mode of decay is via two alpha particles, each with a decay energy of approximately 4.2 million electron volts (MeV). The decay chain of which U-238 is the parent results in the production of both radium-226 and radon-222 and ultimately

terminates with stable lead-206. During this decay series, beta particles and gamma rays are produced as well as additional alpha particles, all at different decay energies (3). Because uranium is ubiquitous in nature, the daily human dietary intake is approximately 1.9 micrograms (4). Therefore, the body normally contains an estimated 90 micrograms of uranium. This corresponds to a body burden of about 30 picocuries. Of this amount, about 66 percent is associated with the skeleton; the remainder is in the soft tissues. The biological half-life is 100 days for whole body and 15 days for the kidneys (4).

After ingestion, the fractional uptake of uranium into the blood is 0.05 for water-soluble inorganic forms and 0.002 for water-insoluble forms (5). The critical organs for ingestion are the skeleton and kidneys. The lung surfaces are the critical organ after inhalation, although there is some solubilization of deposited uranium followed by absorption or ingestion (4).

Because Rn-222 is an inert gas, most of the inhaled gas is exhaled, with only that which decayed potentially remaining within the lungs. These radioactive materials deposited within the lung expose the bronchial epithelium lining the respiratory system, resulting in an elevated risk of lung cancer (5,6). Exposure to radon and radon progeny has been directly correlated with the appearance of lung cancer in humans. The first epidemiological studies of radon exposure were conducted in 1879, in Europe. Since then, such studies have been conducted worldwide and many are still in progress. The studies involve uranium miners and show increasing risks of lung carcinomas as accumulated exposure to these products increased (6).

Rn-222 decays by emitting an alpha particle with an energy of approximately 5.5 MeV and gamma rays with an energy of 0.51 MeV. The half-life of Rn-222 is 3.8 days (3). The decay products are also radioactive, emitting mostly beta particles and gamma rays with an alpha particle released during one decay step. These radon progeny, with half-lives ranging from seconds to over 20 years, ultimately decay to a stable (nonradioactive) form of lead.

The effects of biological exposure to radon are difficult to evaluate. Radon is inert and therefore does not attach to surfaces. However, the decay progeny are charged particles and can electrostatically attach to surfaces. Most progeny immediately attach to aerosols. The ratio of attached progeny to unattached progeny is important in dose calculations for as the ratio increases, the radiation dose to lung surfaces increases. Other factors affecting the lung dose include the ratio of Rn-222 to its progeny, the breathing patterns, lung characteristics, sex, and age of the individual exposed. In a recent report from the National Research Council (NRC), the dose from the radon progeny was of greater risk than exposure to radon gas (6). Dose estimates have been published by the National Council on Radiation Protection and Measurements (NCRP) (5). The NCRP estimates that the risk of developing lung cancer

Exposure to Rn-222 is 2.1×10^{-3} per pCi/L exposure under environmental conditions. The NCRP also states that the dose to the bronchial regions of a typical working adult because of exposure to Rn-222 is 0.27 rad per year per pCi/L. For a 10-year old child (12 hours active, 12 hours resting), the dose estimate is 0.45 rad/year per pCi/L.

D. Estimates of Radiation Exposure to Local Residents

Because detailed environmental monitoring for heavy metals and radioactive materials has not been supplied to the ATSDR, it is difficult to determine the health risks due to internal uptake of these materials. However, the external exposure to ionizing radiation can be evaluated using the on-scene monitoring results obtained by the ATSDR and the NSO. It is possible that the radiation exposures at these sites poses an imminent radiation health hazard to local residents. For the sites discussed in this Health Advisory, the ATSDR is defining an imminent radiation health hazard as exposures that exceed the regulations for radiation exposure to minors (as described in 10 CFR 20.104) and exposure to the public in areas of unrestricted access (10 CFR 20.105).

The Brown-Vandever mine site is in a residential area. In estimating the annual exposure to external ionizing radiation because of the contaminants in the area, the ATSDR used the following assumptions for a maximally exposed individual (MEI). The MEI would live on the site for 100 percent of the time (24 hours) and 365 days per year. The average exposure, including background in the area, is estimated conservatively to be approximately 125 uR/h. Assuming these values and the 24-hour exposure, the external radiation at this site could result in an individual receiving an external annual exposure of nearly 1 R, about 5 percent of which is from natural background as measured in the vicinity of the site (6 uR/h for 8,760 hours).

The risks of exposure to radiation have been investigated for nearly 100 years and the values have been extensively peer reviewed and accepted by the scientific community. In terms of risk estimates, the NCRP, in 1987, used a risk value for excess cancer mortality of 1×10^{-4} per rem per year for whole body exposure (7). In 1990, the NRC released the Biological Effects of Ionizing Radiation Report V, (BEIR V) (8). This report places the risk of excess cancer mortality as a result of continuous lifetime exposure to 0.1 rem per year at 520 for males and 600 for females per 100,000 population (Table 4-2, BEIR V report). Using the estimated population of 500 persons for this area, this would calculate to approximately three excess cancer deaths to residents as a result of exposure to the radiation over an estimated lifetime of 70 years. The American Cancer Society estimates that the expected rate of cancer deaths is on the order of 15 to 25 deaths for a population of 500 individuals.

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Furthermore, because of the inherent production of radon released from the uranium-containing ores, the internal radiation dose, especially to the bronchial epithelium of the lungs, could be even higher. In a 1988 report, the NRC stated that the estimated dose to these tissues far exceeds any dose to organs from external natural background radiation (6). As an organ system, the allowable exposure limits for the lungs can exceed the whole body exposure dose limits (7). However, since no specific radon measurements have been made in this area, estimates of potential internal lung exposure to radon cannot be evaluated at this time.

Conclusions

The Agency for Toxic Substances and Disease Registry concludes that the Navajo-Brown Vandever and the Navajo-Desiderio Uranium Mining Areas may pose a potential significant hazard to human health for residents of these areas based on these premises:

1. The predictions of the external exposure model using the estimated exposures to ionizing radiation exceed the recommendations of the National Council on Radiation Protection and Measurements by a factor of 10. These recommendations state that the public exposure limit to continuous or frequent ionizing radiation should not exceed 0.1 rem per year (7), whereas, the estimated exposure to residents in the vicinity of the Brown Vandever mine could be on the order of 1 R (equivalent to 1 rem).
2. Possible human consumption of livestock potentially contaminated with heavy metals following the ingestion of standing water may pose a hazard to human health.
3. The many open mine areas, mine shafts, and the unrestricted access to these areas create a safety hazard.
4. Since evidence suggests that radioactive contaminants are migrating off-site and that heavy metals may be associated with the radioactive material, local food and livestock crops could be contaminated. This could result in a significant internal exposure to both radioactive materials and heavy metals if these crops are ingested.
5. It is apparent that not all local residents are supplied with public water. Because of the runoff and surface contamination around these sites, the water quality of the individual wells may be suspect and hazardous to humans chronically exposed to radioactive materials and heavy metals.

RECOMMENDATIONS

The ATSDR proposes the following health actions to assist local residents:

1. The ATSDR, in coordination with the Navajo Tribal Council, the IHS, the BIA, the State of New Mexico, and other appropriate agencies, will conduct an environmental health education program to advise the public and medical community of the nature and possible consequences of exposure to ionizing radiation and heavy metal contaminants at the N-BV and N-D sites. Health education materials and assistance will be provided to local health care providers and other appropriate local public health officials.
2. The ATSDR will consider conducting health surveillance activities for populations at these sites.
3. The ATSDR will consider conducting a radiation or heavy metal exposure study of the local residents once additional health-related information on the local residents becomes available.

Because of the limited environmental sampling data available to both the ATSDR and the EPA, we recommend the following additional actions to protect the public health of area residents:

4. The responsible environmental regulatory agencies should within the calendar quarter, initiate data collection efforts to begin the characterization and determination of the extent of the radioactive contamination and possible presence of heavy metals. This sampling should include public water supplies and private wells in the area. Those wells exceeding standards should not be used for potable water and residents should be supplied with alternate potable water.
5. During this phase, personal radiation dosimeters and radon detection devices should be provided by the appropriate agencies to local residents to begin to estimate the external radiation exposure being received.
6. During these environmental studies and personal monitoring efforts, if the data being collected indicates that an imminent radiation health hazard exists to the area residents, then immediate steps, including consultation with the ATSDR, should be taken to mitigate that health hazard.
7. The mitigation or remediation would include, as appropriate, dissociation of local residents from the site until the direct public health hazard is removed. The remediation of the public health hazard should occur in the most expeditious manner consistent with Federal and State environmental protection, health, and radiation protection laws and regulations. Appropriate steps should be taken to protect public health during any removal actions (e.g., dust control, site access restrictions, and monitoring of radiation levels).

8. If these analyses indicate that the radiation exposures would result in a long term, chronic exposure, then applicable measures should be taken by the appropriate remedial regulatory agencies to remediate the public health hazard in the most expeditious manner and consistent with all applicable Federal, Tribal, and State guidelines and recommendations.
9. The appropriate agency should sample biota, food crops, and livestock to ascertain the potential for internal radiation exposure through consumption of contaminated food products and to identify addition potential sources of external exposure.
10. The appropriate responsible agency should take steps to prevent access to or otherwise make physically safe the various open mine areas, pits, and shafts.
11. Governmental agencies and any involved private sector organizations should work closely with Navajo representatives to ensure that cultural awareness and respect are observed and practiced.

For additional information, please contact the ATSDR at the following address:

Robert C. Williams, P.E.
Director, Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry
1600 Clifton Road, NE, MS E-32
Atlanta, Georgia 30333
(404) 639-0610
FTS 236-0610

REFERENCES

1. Molloy P. Preliminary Assessment for the Navajo-Brown Vandever Uranium Mine. Window Rock, AZ: The Navajo Nation. May 20, 1990.
2. Edison S. Preliminary Assessment for the Navajo-Desiderio Group Uranium Mines. Window Rock, AZ: The Navajo Nation. July 30, 1990.
3. U.S. Department of Health, Education and Welfare. Radiological Health Handbook. Washington, DC; 1970.
4. Eisenbud M. Environmental Radioactivity from Natural, Industrial, and Military Sources, 3rd ed. New York: Academic Press, Inc., 1987:475.
5. NCRP. Evaluation of Occupational and Environmental Exposures to Radon and Radon Daughters in the United States. NCRP Report 78. Bethesda: National Council on Radiation Protection and Measurements, 1984.
6. National Research Council. Health Risks of Radon and Other Internally Deposited Alpha-emitters. BEIR IV. Washington, D.C.: National Academy Press, 1988.
7. NCRP. Recommendations on Limits for Exposure to Ionizing Radiation. NCRP Report 91. Bethesda: National Council on Radiation Protection and Measurements, 1987.
8. National Research Council. Health Effects of Exposure to Low Levels of Ionizing Radiation. BEIR V. Washington, D.C.: National Academy Press, 1990.

APPENDIX B

(Contains RCMS Cost Projection)

Exemption 4: CBI

Exemption 4: CBI

Exemption 4: CBI

Exemption 4: CBI

Exemption 4: CBI



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IX

75 Hawthorne Street
San Francisco, Ca. 94105

May 10, 1991

Mr. Mike Tucker
U.S Department of Energy
P.O. Box 2567
Grand Junction, Colorado 81502

RE: Bluewater Uranium Mine Sites, Prewitt, New Mexico

Dear Mr. Tucker:

As discussed in our phone conversation on 5/10/91, the Environmental Protection Agency (EPA) is currently assessing the radiological and environmental hazards associated with the abandoned mines located within the Bluewater Mining District, Prewitt, New Mexico. Two mining sites, the Brown-Vandever Mine and the Navajo-Desiderio Mine, were referred to EPA by the Agency for Toxic Substance and Disease Registry (ATSDR) in October of 1990. A Public Health Advisory was issued by ATSDR in November of 1990 regarding these sites. As a result of this action, EPA's Emergency Response Section (ERS) was tasked to assess the sites in order to determine if an emergency clean-up action was warranted to protect neighboring residents and their livestock.

In late November, ERS conducted a field assessment at both mines. ERS collected soil, water and air samples at each mine. Using standard radiation detection equipment, an extensive gamma radiation survey was performed.

The data collected during this assessment revealed that radiation levels at the Brown-Vandever Site ranged from three microroentgens per hour (uR/h) to over 750 uR/h at waist level. On contact with the ground, the maximum level recorded exceeded 1,225 uR/h. In addition to excess gamma radiation, the soil sampling data indicated that the levels of radium-226 in the top 15 cm of soil exceed the regulatory limits (40 CFR 192) and radon-222 emission rates exceed the guidelines of 20 pCi per square meter per second (40 CFR 192).

Enclosed for your review is a copy of the data generated during the assessment, a copy of the ATSDR Health Advisor, and property description of the sites.

EPA believes that there may exist a significant health risk associated with living near these exposed mine tailings. At this time, EPA is researching the history of these mine operations in order to determine "potential responsible parties". EPA is working closely with the Department of Interior, Navajo Nation and

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the State of New Mexico in order to solve this complex matter. EPA is planning to conduct a reclamation action at these mine sites to reduce the radiation hazards. To assist us in our effort in protecting the environment, EPA is requesting that the Department of Energy assist in this investigation. If you have any questions, please contact me at 415-744-2298.

Sincerely,



Robert Bornstein
Federal On-Scene-Coordinator
Emergency Response Section

cc: Bill Weis, ERS Enforcement



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IX

**75 Hawthorne Street
San Francisco, Ca. 94105**

21 MAR 1991

**CERTIFIED MAIL NO. P 347535113
RETURN RECEIPT REQUESTED**

**Mr. Walt Mills
Acting Area Director
Bureau of Indian Affairs
Navajo Area Office
Window Rock
Navajo Nation, Arizona 86515**

**Re: Request for Information Pursuant to Section 104(e)
of CERCLA and Section 3007 of RCRA**

Dear Mr. Mills:

BACKGROUND

The United States Environmental Protection Agency (EPA) is currently investigating the source, extent and nature of the release or threatened release of hazardous substances, pollutants or contaminants, or hazardous wastes on or about the Bluewater Uranium Mining Sites, hereinafter referred to as the "Sites". The Sites are located approximately five miles west of Prewitt, New Mexico, and 28 miles southeast of the Eastern boundary of the Navajo Nation Reservation, in the Haystack Chapter.

The Sites are located on four Indian Allotments and a one parcel of Federal land which is administered by the Bureau of Indian Affairs. Specific information regarding each of the five Sites is contained below:

Allottee:	Brown Vandever	Allottee:	Nanabah Vandever
Allotment No:	077031	Allotment No:	059419
Section:	18	Section:	24
Range:	10W	Range:	11W
Township:	13N	Township:	13N
Allottee:	Walter Vandever	Allottee:	Na ta nah gah Esedero (John Desidero)
Allotment No:	077411	Allotment No:	059387
Section:	13	Section:	26
Range:	11W	Range:	10W
Township:	13N	Township:	13N
Permitter:	Dept. of Interior, Bureau of Indian Affairs		
Section:	13		
Range:	11W		
Township:	13N		

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On October 3, 1990, the EPA Region IX Emergency Response Section was notified by the Agency for Toxic Substances and Disease Registry (ATSDR) of the potential health hazards which, in its view, were associated with the uranium mine pit surfaces (including former strip mining surfaces), overburden which was previously removed from such mining surfaces, and abandoned ore debris on or about the above-referenced Sites.

On November 21, 1990, the ATSDR drafted a Public Health Advisory concerning the Bluewater Sites, based on the potential health hazards and adverse environmental consequences which it believed were associated with radiation and radionuclide levels found at the Sites. A copy of the final ATSDR Public Health Advisory is enclosed.

On November 15-17, 1990, the EPA Emergency Response Section conducted a preliminary assessment of the Sites. At that time, a gamma radiation survey was completed, and soil, air, and water samples were collected for radionuclide analysis. The data obtained during the preliminary assessment indicated that radiation and radionuclide levels recorded at the various sampling locations at the Sites exceeded the promulgated standards for soil and air.

The current EPA investigation requires inquiry into the identification, nature, and quantity of materials that have been or are generated, stored, treated, or disposed of at, or transported to the Sites. In addition, EPA is seeking information regarding the nature and extent of a release or threatened release of a hazardous substance, pollutant, or contaminant at or from the Sites. The EPA investigation also requires inquiry into the ability of responsible parties to finance or to perform cleanup activities undertaken at the Sites.

SECTION 104(e) REQUEST FOR INFORMATION

EPA believes that the Bureau of Indian Affairs is in possession of information that is relevant to our investigation of the Bluewater Uranium Mining Sites mentioned above. Therefore, pursuant to the authority of Section 104(e) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 (CERCLA), 42 U.S.C. Section 9604(e), EPA requests that you respond to the questions set forth in the enclosed Request for Information. In addition, EPA requests that you provide copies of all documents that your agency possesses or has access to regarding the disposal of wastes at the above-referenced Sites.

Your compliance with the enclosed Request for Information is mandatory. Failure to respond to this request completely and truthfully within twenty (20) calendar days of receipt of this letter, or to adequately justify such failure to respond, may result in further action by EPA pursuant to CERCLA. In this regard, please be advised that the provision of false, fictitious, or fraudulent

fraudulent statements or representations is punishable by criminal penalties of up to ten thousand dollars (\$10,000) or up to five (5) years imprisonment, or both, under 18 U.S.C. Section 1001.

This Request for Information is directed to the U.S. Department of the Interior, Bureau of Indian Affairs, its officers and employees, including any and all divisions and facilities of the BIA which may possess information pertinent to this inquiry, and the officers and employees of such divisions and facilities. This Request for Information is not subject to the approval requirements of the Paperwork Reduction Act of 1980, 44 U.S.C. Section 3501, et seq.

Your response to this Request for Information should be mailed to:

William J. Weis III
Emergency Response Section
U.S. Environmental Protection Agency, H-8-3
75 Hawthorne Street
San Francisco, CA 94105

Please direct any legal questions you may have to Linda Wandres of the Region IX Office of Regional Counsel, at (415) 744-1359, or FTS 484-1359. If you have any technical questions, please contact William J. Weis III of the Emergency Response Section, at (415) 744-2297, or FTS 484-2297.

Due to the seriousness of the problem at the Sites and the legal ramifications of your failure to respond promptly and properly, EPA strongly encourages you to give this matter your immediate attention and to respond to this Request for Information within the time specified above.

Thank you for your cooperation in this matter.

Sincerely,



Jerry Clifford
Deputy Director for Superfund
Hazardous Waste Management Division

Enclosures

cc: (w/o ATSDR Advisory)
Jenny Denetsoni, BIA Realty Officer
Bill Allen, Regional Environmental Assistant, DOI
Ray Churan, Regional Environmental Officer, DOI
Mary Josie Smith, Chief, Hazardous Waste Materials
Division, DOI
Joanne Manygoats, Navajo Superfund Program
Louise Linkin, Navajo EPA

REQUEST FOR INFORMATION**BLUEWATER URANIUM MINING SITES****INSTRUCTIONS**

1. A separate response must be made to each of the questions set forth in this Request for Information.
2. Precede each answer with the number of the question to which it corresponds.
3. In answering each question, identify all contributing sources of information, including all persons and all documentary materials which you consulted in the preparation of your response.
4. EPA understands that many of the various lease documents and lease-related documents which are requested in this letter are currently being held in permanent or archival storage. EPA further understands that this permanent or archival storage may not be located at your office in Window Rock, Arizona, but instead may be located in Gallup, New Mexico, Albuquerque, New Mexico, or some other permanent document storage facility away from your office. Please be advised that EPA considers all documents which are responsive to this request, including stored or archived documents, to be extremely important to EPA's investigation of the Bluewater Mining Sites. Therefore, this Request for Information specifically pertains to and includes all such documents.
5. If information or documents not known or not available to the Respondent as of the date of submission of its response should later become known or available, Respondent must supplement its response to EPA. Moreover, should the Respondent find, at any time after the submission of its response, that any portion of the submitted information is false or misrepresents the truth, Respondent must notify EPA of this fact as soon as possible, and provide EPA with a corrected response.
6. For each document produced in response to this Request for Information, indicate on the document, or in some other reasonable manner, the number of the question to which it responds.
7. You must respond to this Request for Information on the basis of all information and documents in your possession, custody or control, or in the possession, custody or control of your former or current employees, agents, contractors, attorneys, or other representatives.

8. If any documents requested herein have been transferred voluntarily or involuntarily to other persons, agencies or entities, or have been otherwise disposed of, identify each such document and the person to whom it was transferred, describe the circumstances surrounding each such transfer or other disposition, and state the date or approximate date of such transfer or other disposition.
9. The information requested herein must be provided even though the Respondent contends that it possibly includes confidential information or trade secrets. You may, if you desire, assert a confidentiality claim covering part or all of the information requested, pursuant to Sections 104(e)(7)(E) and (F) of CERCLA, 42 U.S.C. Sections 9604(e)(7)(E) and (F), and 40 C.F.R. Section 2.203(b), by attaching to such information at the time it is submitted a cover sheet, stamped or typed legend, or other suitable form of notice employing language such as "trade-secret" or "proprietary" or "company confidential." Information covered by such a claim will be disclosed by EPA only to the extent and only by means of the procedures set forth in 40 C.F.R. Part 2, Subpart B. If no such claim accompanies the information when it is received by EPA, it may be made available to the public by EPA without further notice to you. You should read carefully the above-cited regulations, together with the standards set forth in Section 104(e)(7) of CERCLA, before asserting a business confidentiality claim, since certain categories of information are not properly the subject of such a claim.

DEFINITIONS

The following definitions shall apply to the following words as they appear in this Request for Information:

1. The terms "you," "your" or "Respondent" shall mean the Department of the Interior, Bureau of Indian Affairs, and its officers, managers, employees, contractors, trustees, predecessors, successors, assigns, subsidiaries, representatives and agents.
2. The term "person" shall have the same definition as in Section 101(21) of CERCLA: an individual, firm, corporation, association, partnership, consortium, joint venture, commercial entity, United States Government, State, municipality, commission, political subdivision of a State, or any interstate body.

3. The term "the Sites" shall mean and include all the property described below:

Allottee: Brown Vandever
 Allotment No: 077031
 Section: 18
 Range: 10W
 Township: 13N

Allottee: Nanabah Vandever
 Allotment No: 059419
 Section: 24
 Range: 11W
 Township: 13N

Allottee: Walter Vandever
 Allotment No: 077411
 Section: 13
 Range: 11W
 Township: 13N

Allottee: Na ta nah gah Esedero (John Desidero)
 Allotment No: 059387
 Section: 26
 Range: 10R
 Township: 13N

Permitter: Department of the Interior
 Bureau of Indian Affairs
 Section: 13
 Range: 11W
 Township: 13N

4. The term "hazardous substances" shall have the same definition as that contained in Section 101(14) of CERCLA, and includes all substances so designated pursuant to 40 C.F.R. Section 302, and any mixtures of such hazardous substances with any other substances, including petroleum products.
5. The term "pollutant" or "contaminant" shall have the same definition as that contained in Section 101(33) of CERCLA, and shall include any mixtures of such pollutants and contaminants with any other substances. Petroleum products mixed with pollutants and contaminants are also included in this definition.
6. The terms "furnish," "describe," or "provide" shall mean (1) turning over to EPA either original or duplicate copies of the requested information, where such information is in written form and is in the possession, custody, or control of the Respondent or its agents or representatives, or (2) where responsive information has not yet been memorialized in a document, reducing such information to a documentary form, and submitting that document as part of the response

to this Request for Information. If responsive information is not in your possession, custody, or control, indicate in your response where, and from whom, such information or documents may be obtained.

7. The term "identify" means, with respect to a natural person, to set forth his or her full name, present or last known business address and business telephone number, the name of that person's employer, and a description of the present or last known title and job responsibilities of such a person.
8. The term "identify" means, with respect to a corporation, partnership, business trust or other association or business entity (including a sole proprietorship) to set forth its full name, address, legal form (e.g. corporation, partnership, etc.), organization, if any, and a brief description of its business.
9. The term "identify" means, with respect to a document, to provide its customary business description, its date, its number if any (e.g., invoice or purchase order number), the identity of the author, addressor, addressee and/or recipient, and the substance or the subject matter thereof.
10. The term "release" has the same definition as that contained in Section 101(22) of CERCLA.
11. The term "document" means any object that records, stores, or presents information, and shall include writings of any kind, formal or informal, whether or not wholly or partially in handwriting, including, but not limited to, originals and all nonidentical copies of correspondence, memoranda, notes, letters, and messages (including drafts and all documents attached to, or referred to in the original document), electronic communications or records (including, but not limited to, telefaxes, telexes, and minutes, memoranda or notations of telephone and any other conversations and meetings), invoices, receipts, endorsements, checks, bank drafts, canceled checks, deposit slips, withdrawal slips, orders, record books, diaries, calendars, desk pads, notebooks, bulletins, circulars, pamphlets, statements, reports, contracts, studies, notices, analyses, comparisons, graphs, charts, interoffice or intraoffice communications, microfilm or other film records, photographs, sound recordings on any type of device, punch cards, discs, or disc packs, and tapes or other types of memory devices generally associated with computers and data processing (together with the programming instructions and other written materials necessary to use such memory storing devices.)

12. The terms "and" and "or" shall be construed either disjunctively or conjunctively as necessary to bring within the scope of this Request for Information any information which might otherwise be construed to be outside its scope.
13. The term "hazardous waste" shall have the same definition as that contained in Section 1003(5) of RCRA.
14. The term "hazardous materials" means all hazardous substances, pollutants or contaminants, and hazardous wastes, as defined herein.
15. The term "property interest" means any interest in property, including, but not limited to, mineral rights, surface rights, any ownership interest (including an easement or any other interest less than a fee simple absolute), any interest in the rental of property, any interest in a corporation or person that owns or rents, or owned or rented property in the past, any interest as either the trustee or beneficiary of a trust that owns or rents, or owned or rented property in the past, any interest as either the trustee or beneficiary of a trust relationship, through which property has been managed or leased, or any other fiduciary or legally significant relationship regarding property held in trust for the benefit of specified persons.
16. The terms "transaction" or "transact" mean any sale, transfer, delivery (including the giving of a gift), or other change in ownership or change of possession.
17. Words in the masculine shall be construed in the feminine, and vice versa, and words in the singular shall be construed in the plural, and vice versa, where appropriate in the context of a particular question or questions.
18. All terms not defined herein shall have their ordinary meanings, unless such terms are defined in CERCLA, RCRA, 40 C.F.R. Part 300 or 40 C.F.R. Parts 260-280, in which case the statutory or regulatory definitions shall apply.

QUESTIONS

1. For each question contained herein, identify the person(s) answering the question on behalf of the Respondent.
2. Identify all persons consulted in the preparation of the answers to these questions.
3. Identify all documents consulted, examined, or referred to in the preparation of the answers to these questions, and provide true and accurate copies of all such documents.

4. If you have reason to believe that there may be persons able to provide a more detailed or complete response to any questions contained herein, or who may be able to provide additional responsive documents, identify such persons and the additional information or documents that you believe they may have.
5. For each and every current owner, allottee or lessee of any portions of the Sites:
 - a. Identify each such person and the nature of their current property interest in the Sites;
 - b. Provide copies of all documents evidencing or relating to such current ownership, allotment or lease, including, but not limited to, purchase and sale agreements, deeds, leases, easements, servitudes, and other documents relating to title and property interests relating to the Sites;
 - c. Provide specific information and documentation regarding any and all current uranium mining and prospecting leases, contracts or other agreements which may have been granted in connection with property or mineral resources located on or about the Sites. The documentation to be provided to EPA with regard to such leases, contracts or agreements shall include the complete correspondence file for each such lease, contract or agreement, including, but not limited to, all correspondence, memoranda, maps, mining plans, insurance documents, security bonds, inspection reports, reclamation plans, formal and informal agreements, and all other "documents," as defined above, relating to the aforementioned leases, contracts or agreements.
6. For each and every prior operator of any portions of the Sites:
 - a. Identify each such person and the nature of their past property interest in, or operation of, the Sites;
 - b. Describe the portion of the Sites operated or leased by each such person and state the dates during which each portion was operated or leased;
 - c. Provide copies of all documents evidencing or relating to such past operation or lease, including, but not limited to, leases and lease agreements, easements, servitudes, and other documents relating to property interests in, or operation of the Sites;
 - d. Provide specific information and documentation regarding any and all past uranium mining and prospecting leases, contracts or agreements which may have been granted in connection with property and mineral resources located on or about the Sites. The documentation to be provided to EPA with

regard to such leases, contracts or agreements shall include the complete correspondence file for each such lease, contract or agreement, including, but not limited to, all correspondence, memoranda, maps, mining plans, lease agreements, insurance documents, security bonds, inspection reports, reclamation plans, formal and informal agreements, and all other "documents," as defined above, relating to the aforementioned leases, contracts or agreements.

e. Provide EPA with any and all information or evidence in your possession, or in the possession of your employees, contractors, representatives or agents, concerning the release or threatened release of hazardous materials at the Sites during the period in which the prior operator or lessee identified above had a property interest in, or operated facilities, on or about the Sites.

7. Identify all persons, including Respondent's employees, who may have knowledge, information or documents concerning the generation, use, purchase, treatment, storage, disposal or other handling of hazardous materials at, or transportation of hazardous materials to, the Sites.
8. Provide EPA with a list and brief description of all existing technical or analytical information which is in your possession, or in the possession of your employees, contractors, representatives or agents, concerning the presence or release, or threatened release, of hazardous materials on or about the Sites, and other relevant information and documentation concerning the soil, water (ground and surface), geology, geohydrology or air quality on or about the Sites.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IX

75 Hawthorne Street
San Francisco, Ca. 94105

January 29, 1991

MEMORANDUM

SUBJECT: Bluewater Uranium Mine Preliminary Assessment Data

FROM: Donald C. White, Chief
Field Operations BranchTO: Stephen Luftig, Director
Environmental Response Division

Enclosed are the radionuclide and gamma survey data collected by the Emergency Response Section (ERS) preliminary assessment, conducted on November 15-16, 1990, at the Brown-Vandever and Desiderio Uranium Mine Sites, located outside of Prewitt, Navajo Nation, New Mexico. This assessment was performed at the request of the Agency for Toxic Substances and Disease Registry (ATSDR) to identify if the Sites pose any immediate adverse environmental and health hazards.

Site Background

The Navajo-Brown Vandever (N-BV) and Navajo-Desiderio (N-D) mine sites are located within the Ambrosia Lake subdistrict of the Grants Uranium Mining District. The N-BV mine site encompasses approximately 155 acres, and the N-D covers 130 acres. The sites lie within a sparsely populated agricultural area.

Several families live on both mine sites. Approximately thirty people live on the N-BV site, including children, and approximately forty people live on the N-D site. The land is primarily utilized as grazing areas for the cattle, horses, sheep and goats.

Both mine sites consist of strip mine pits, tailing piles and open vent and mine shafts. There are presently no barriers prohibiting access to these mined areas.

ATSDR issued a Health Advisory for the sites on November 21, 1990. Since then, ERS has been consulting with Greg Demspey and Colleen Petullo, Office of Air and Radiation, Las Vegas and Bill Nelson, ATSDR.

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Data

Figure 1 shows the locations of the mine sites. Figure 2 shows the Brown-Vandever Mine Site and Figure 3 shows the Desiderio Mine Site. Table 1 contains the gamma survey data. Table 2 lists the radionuclide data obtained from the water and soil samples. Figure 4 divides the Brown-Vandever Mine Site into four sections which were surveyed and sampled. Figures 5-8 show the sampling locations within each section of the Brown-Vandever Mine Site. Figure 9 shows the sampling locations from the Desiderio Mine Site. Appendix A contains the results of the Radon Flux experiment conducted at the Desiderio Mine Site. Appendix B contains the heavy metal sample results. Appendix C contains the laboratory data sheets.

ERD Assistance

We are requesting ERD assistance in interpreting the radionuclide assessment data for the purpose of determining if an imminent and substantial health risk exists at either of the sites. For instance, the data reveals that nearly all of the sampling points within the mined areas appear to exceed the promulgated standard for Radium-226, which should not exceed 5 pCi/g above background within the first fifteen centimeters of soil, as outlined in 40 CFR Section 192.12. We need help in determining if the sites pose an acute (need to do a removal action) or a chronic (remedial action more appropriate) health risk. One criterion that could be used to determine if a removal action is warranted is an increased carcinogenic health risk of 1 in 10,000 or more after a two year exposure. This criterion is based on the following:

- A) A risk of 1 in 10,000 is the high end of the risk range established by the NCP which requires a response action;
- B) It is estimated that it would take over two years for the remedial program to be able to address these sites since neither has yet to be placed on the NPL.

It is important to select a number or criteria that can be used on more than one site since there are many similar sites in Arizona and New Mexico. Our decision is likely to set a precedent for future potential removal actions at these type of uranium mine tailing sites. In addition, ATSDR must determine what steps they must undertake in response to their Health Advisory based on what we determine to do at these sites.

I look forward to your quick response to this issue. If you have any questions concerning the data, please contact Robert Bornstein, On-Scene-Coordinator, at 415-744-2298 (FTS 484-2298).

cc: Dave Lopez, ROB

Bruce Englebert, ROB Branch Chief

(Table 1. Continued)

Inst.	Time	Station	Ground	Waist	Comments
1 2	1055 1057	Station 9	190 uR/hr 120 urem/hr	170 uR/hr 90 urem/hr	
1 2	1105 1108	Station 10	1250 uR/hr 750 urem/hr	800 uR/hr 350 urem/hr	open are a
1 2	1113 1115	Station 11	400 uR/hr 300 urem/hr	200 uR/hr 150 urem/hr	
1 2	1118 1120	Station 12	600 uR/hr 500 urem/hr	500 uR/hr 300 urem/hr	
1 2	1122 1124	Station 13	500 uR/hr 250 urem/hr	500 uR/hr 400 urem/hr	
1 2	1127 1128	Station 14	600 uR/hr 300 urem/hr	700 uR/hr 300 urem/hr	
1 2	1134 1136	Station 15	230 uR/hr 150 urem/hr	280 uR/hr 150 urem/hr	
1 2	1140 1141	Station 16	700 uR/hr 300 urem/hr	600 uR/hr 250 urem/hr	
1 2	1150 1151	Station 17	80 uR/hr 40 urem/hr	120 uR/hr 35 urem/hr	
1 2	1155 1156	Station 18	90 uR/hr 50 urem/hr	65 uR/hr 35 urem/hr	
1 2	1300 1303	Station 19 SECTION 2	700 uR/hr 450 urem/hr	600 uR/hr 350 urem/hr	
1 2	1306 1309	Station 20	900 uR/hr 650 urem/hr	800 uR/hr 500 urem/hr	on pad
1 2	1314 1315	Station 21	300 uR/hr 250 urem/hr	230 uR/hr 150 urem/hr	attic
1 2	1320 1321	Station 22	230 uR/hr 130 urem/hr	210 uR/hr 100 urem/hr	edge of pile
1 2	1330 1334	Station 23	120 uR/hr 40 urem/hr	50 uR/hr 40 urem/hr	

(Table 1. Continued)

Inst.	Time	Station	Ground	Waist	Comments
1 2	1346 1348	Station 24	220 uR/hr 120 urem/hr	220 uR/hr 110 urem/hr	
1 2	1350 1352	Station 25	500 uR/hr 250 urem/hr	400 uR/hr 175 urem/hr	
1 2	1358 1400	Station 26	300 uR/hr 170 urem/hr	300 uR/hr 170 urem/hr	
1 2	1405 1408	Station 27	250 uR/hr 150 urem/hr	200 uR/hr 150 urem/hr	
1 2	1320 1322	Station 28 SECTION 3	10 uR/hr 5 urem/hr	10 uR/hr 5 urem/hr	11/15/90
1 2	1330 1330	Station 29	N/A	13 uR/hr 10 urem/hr	at window of vent
1 2	1333 1334	Station 30	80 uR/hr 50 urem/hr	80 uR/hr 50 urem/hr	lots of stones
1 3	1337 1338	Station 31	75 uR/hr 300 uR/hr	Lgm micro	on casing in hole
1 2	1345	Station 32	350 - 90 uR/hr on brick wall 250 - 50 urem/hr on brick wall		
1 2	1355 1400	Station 33 SECTION 4	15 uR/hr 10 urem/hr	15 uR/hr 10 urem/hr	
1 2	1405 1407	Station 34	125 uR/hr 90 urem/hr	90 uR/hr 50 urem/hr	
1 2	1410 1411	Station 35	25 uR/hr 10 urem/hr	25 uR/hr 10 urem/hr	
1 2	1415 1417	Station 36	225 uR/hr* 130 urem/hr	110 uR/hr# 70 urem/hr	on wall face
1 2	1420 1423	Station 37	600 uR/hr 300 urem/hr	600 uR/hr 300 urem/hr	dug area
1 2	1430 1433	Station 38	240 uR/hr 200 urem/hr	200 uR/hr 240 urem/hr	

(Table 1. Continued)

Inst.	Time	Station	Ground	Waist	Comments
1 2	1440 1443	Station 39	18 uR/hr 10 urem/hr	18 uR/hr 10 urem/hr	
1 2	1446 1448	Station 40	700 uR/hr 600 urem/hr	600 uR/hr 300 urem/hr	
1 2	1452 1453	Station 41	500 uR/hr* 350 urem/hr	400 uR/hr# 250 urem/hr	

* On contact with rock/tailing outcrop

3 feet from contact

GAMMA RADIATION SURVEY DATA

DESIDERIO MINE SITE, NAVAJO NATION

NOVEMBER 15, 1990

Operator - Collen Petullo Recorder - Vicky Radvilla
 Instrument ID# Calibration date Calibration Source
 1 Ludlum 19 452663 11-08-90 Ra-226
 2 Bicron 8254:1 10-15-90 Cs-137
 3 Ludlum 12 140830 11-08-90 Pu-239, Sr-90
 Pancake

Date 11/15/90 SECTION 1

(Table 1. Continued)

Inst.	Time	Station	Ground	Waist	Comments
1 3	0825	Background1	11 uR/hr 100 cpm	11 uR/hr 100 cpm	2.5 mi from site
1 3	0830	Background2	11 uR/hr 100 cpm	11 uR/hr 100 cpm	1.0 mi from site
1 2	0855 0856	Station 1	12 uR/hr 7 urem/hr	12 uR/hr 6 urem/hr	at pond site
1 2	0857 0859	Station 2	18 uR/hr 8 urem/hr	18 uR/hr 8 urem/hr	at fence
1 2	0940 0941	Station 3	10 uR/hr 5 urem/hr	10 uR/hr 5 urem/hr	at base station
1 2	0955 0956	Station 4	20 uR/hr 7 urem/hr	24 uR/hr 7 urem/hr	large pit
1 2	1000 1001	Station 5@	90 uR/hr 50 urem/hr	75 uR/hr 40 urem/hr	pile near St. 4
1 2	1045 1046	Station 6@	135 uR/hr 75 urem/hr	120 uR/hr 60 urem/hr	
1 2	1055 1056	Station 7@	85 uR/hr 50 urem/hr	75 uR/hr 40 urem/hr	
1 2	1058 1100	Station 8	170 uR/hr 90 urem/hr	120 uR/hr 60 urem/hr	
1 2	1105	Station 9			sediment only

(Table 1. Continued) Date 11/15/90 SECTION 1

Inst.	Time	Station	Ground	Waist	Comments
1 2	1107	Station 10			sediment only
1 2	1153 1154	Station 11	55 uR/hr 30 urem/hr	55 uR/hr 30 urem/hr	
1 2	1214 1215	Station 12	900 uR/hr 400 urem/hr	400 uR/hr 250 urem/hr	near attic

@ radon flux canister area

TABLE 2
EPA ERS PRELIMINARY ASSESSMENT LABORATORY RESULTS
NAVAJO-BROWN-VANDEVER
NOVEMBER 15-16, 1990

SAMPLE LOCATION	ID#	RADIONUCLIDE	RESULTS	UNITS
(WATER SAMPLES) Brown Vandever Livestock Well B-V)	W1	Ra(226)	00.8 ± 0.1	pC/l
		Ra(228)	2.0 ± 5.0	
		U(233-4)	2.0 ± 0.4	
		U(235)	00.3 ± 0.1	
		U(238)	0.4 ± 0.2	
B-V Livestock Well	W2	Ra(226)	00.2 ± 0.1	pC/l
		Ra(228)	0.0 ± 5.0	
		U(233-4)	0.5 ± 0.2	
		U(235)	00.0 ± 0.1	
		U(238)	00.0 ± 0.1	
B-V Tap Water	W3	Ra(226)	00.2 ± 0.1	pC/g
		Ra(228)	0.0 ± 5.0	
		U(233-4)	2.1 ± 0.5	
		U(235)	1.0 ± 0.3	
		U(238)	0.8 ± 0.3	
Water Line B-V	W4	Ra(226)	.1 ± 0.1	pC/l
		Ra(228)	0 ± 5	
		U(233-4)	1.4 ± 0.4	
		U(235)	0.5 ± 0.2	
		U(238)	0.5 ± 0.2	
Desiderio Stock Pond	W5	Ra(226)	.3 ± 0.1	pC/l
		Ra(228)	0 ± 5	
		U(233-4)	2.3 ± 0.4	
		U(235)	0.1 ± 0.2	
		U(238)	2.2 ± 0.2	
Desiderio Tap	W6	Ra(226)	.3 ± 0.1	pC/l
		Ra(228)	0 ± 5	
		U(233-4)	1.2 ± 0.4	
		U(235)	0.0 ± 0.2	
		U(238)	0.2 ± 0.2	
Prischod Well	W7	Ra(226)	1.0 ± 0.1	pC/l
		Ra(228)	22.0 ± 6	
		U(233-4)	130.0 ± 10	
		U(235)	3.0 ± 0.5	
		U(238)	74.0 ± 7	

(Table 2. Continued)

SAMPLE LOCATION		ID#	SOIL SAMPLES		RADIONUCLIDE	RESULTS	UNITS
BACKGROUND					Ra(226)	00.8 ± 00.1	pC/g
Road to B-V		A9			Ra(228)	0.0 ± 01.0	
					U(233-4)	0.6 ± 00.1	
					U(235)	00.0 ± 0.1	
					U(238)	000.7 ± 00.1	
Station 20		1A			Ra(226)	300.0 ± 10.0	pC/g dry
(Section 2)					Ra(228)	1.0 ± 01.0	
B-V					U(233-4)	240.0 ± 20.0	
					U(235)	13.0 ± 1.0	
					U(238)	250.0 ± 20.0	
Station 22		2A			Ra(226)	34.0 ± 3.0	pC/g dry
(Tailing Pile)					Ra(228)	0.0 ± 1.0	
Section 2					U(233-4)	25.0 ± 2.0	
B-V					U(235)	1.0 ± 0.2	
					U(238)	25.0 ± 2.0	
Station 23		3A			Ra(226)	24.0 ± 2.0	pC/g
(Drainage Area)					Ra(228)	0.0 ± 1.0	
Section 2					U(233-4)	21.0 ± 2.0	
B-V					U(235)	.8 ± 0.1	
					U(238)	20.0 ± 2.0	
Station 25		4A			Ra(226)	4.7 ± 0.5	pC/g
(Upper Drainage)					Ra(228)	0.0 ± 1.0	
Section 2					U(233-4)	3.4 ± 0.4	
B-V					U(235)	.1 ± 0.1	
					U(238)	3.5 ± 0.4	
Station 6		5A			Ra(226)	49.0 ± 5.0	pC/g
(Pebble Area)					Ra(228)	.0 ± 1.0	
Section 1					U(233-4)	24.0 ± 2.0	
B-V					U(235)	1.0 ± 0.2	
					U(238)	25.0 ± 2.0	
Station 10		6A			Ra(226)	130.0 ± 10.0	pC/g
(Strip Area)					Ra(228)	0.0 ± 1.0	
Section 1					U(233-4)	100.0 ± 20.0	
B-V					U(235)	4.7 ± 0.5	
					U(238)	100.0 ± 10.0	

(Table 2. Continued)

SAMPLING LOCATION	ID#	RADIONUCLIDE	RESULTS	UNITS
Station 11 Section 1 B-V	7A	Ra(226)	260.0 \pm 10.0	pC/g
		Ra(228)	1.0 \pm 1.0	
		U(233-4)	290.0 \pm 30.0	
		U(235)	20.0 \pm 2.0	
		U(238)	310.0 \pm 30.0	
Wash Area Near B-V	8A	Ra(226)	1.9 \pm 0.2	pC/g
		Ra(228)	1.0 \pm 1.0	
		U(233-4)	1.1 \pm 0.1	
		U(235)	00.0 \pm 0.1	
		U(238)	1.1 \pm 0.2	
Background For Desiderio Road to Desiderio	10A	Ra(226)	1.3 \pm 0.1	pC/g
		Ra(228)	0.0 \pm 1.0	
		U(233-4)	0.6 \pm 0.1	
		U(235)	00.0 \pm 0.1	
		U(238)	0.8 \pm 0.2	
Radon Flux Area Desiderio	12A	Ra(226)	34.0 \pm 3.0	pC/g
		Ra(228)	0.0 \pm 1.0	
		U(233-4)	17.0 \pm 2.0	
		U(235)	00.7 \pm 0.1	
		U(238)	17.0 \pm 0.2	
Radon Flux Area Desiderio	13A	Ra(226)	30.0 \pm 3.0	pC/g
		Ra(228)	0.0 \pm 1.0	
		U(233-4)	17.0 \pm 2.0	
		U(235)	00.0 \pm 0.1	
		U(238)	1.1 \pm 0.2	
Station 11 Desiderio	14A	Ra(226)	1.8 \pm 0.2	pC/g
		Ra(228)	0.0 \pm 0.6	
		U(233-4)	0.6 \pm 0.1	
		U(235)	0.0 \pm 0.1	
		U(238)	0.7 \pm 0.1	
Station 12 Desiderio	15A	Ra(226)	3.0 \pm 0.3	pC/g
		Ra(228)	0.0 \pm 1.0	
		U(233-4)	1.7 \pm 0.2	
		U(235)	0.1 \pm 0.1	
		U(238)	1.5 \pm 0.1	

(Table 2. Continued)

SAMPLING LOCATION ID#	RADIONUCLIDE	RESULTS	UNITS
Station 30 Drainage near Station 30 B-V Section 3	18A	Ra(226) 0.8 \pm 0.1 Ra(228) 1.0 \pm 1.0 U(233-4) 0.7 \pm 0.1 U(235) 0.1 \pm 0.1 U(238) 0.8 \pm 0.1	pC/g
Station 36 On Tailing Outcrop B-V Section 3	19A	Ra(226) 20.0 \pm 2.0 Ra(228) 0.0 \pm 1.0 U(233-4) 28.0 \pm 3.0 U(235) 1.2 \pm 0.2 U(238) 28.0 \pm 3.0	pC/g
Duplicate of 19A	20A	Ra(226) 33.0 \pm 3.0 Ra(228) 0.0 \pm 1.0 U(233-4) 29.0 \pm 3.0 U(235) 1.3 \pm 0.2 U(238) 28.0 \pm 3.0	pC/g
Station 40 Section 4 B-V	21A	Ra(226) 450.0 \pm 50.0 Ra(228) 0.0 \pm 01.0 U(233-4) 330.0 \pm 30.0 U(235) 29.0 \pm 3.0 U(238) 390.0 \pm 40.0	pC/g

Laboratory -- TMA Eberline
7021 Pan American Freeway, N.E.
Albuquerque, NM

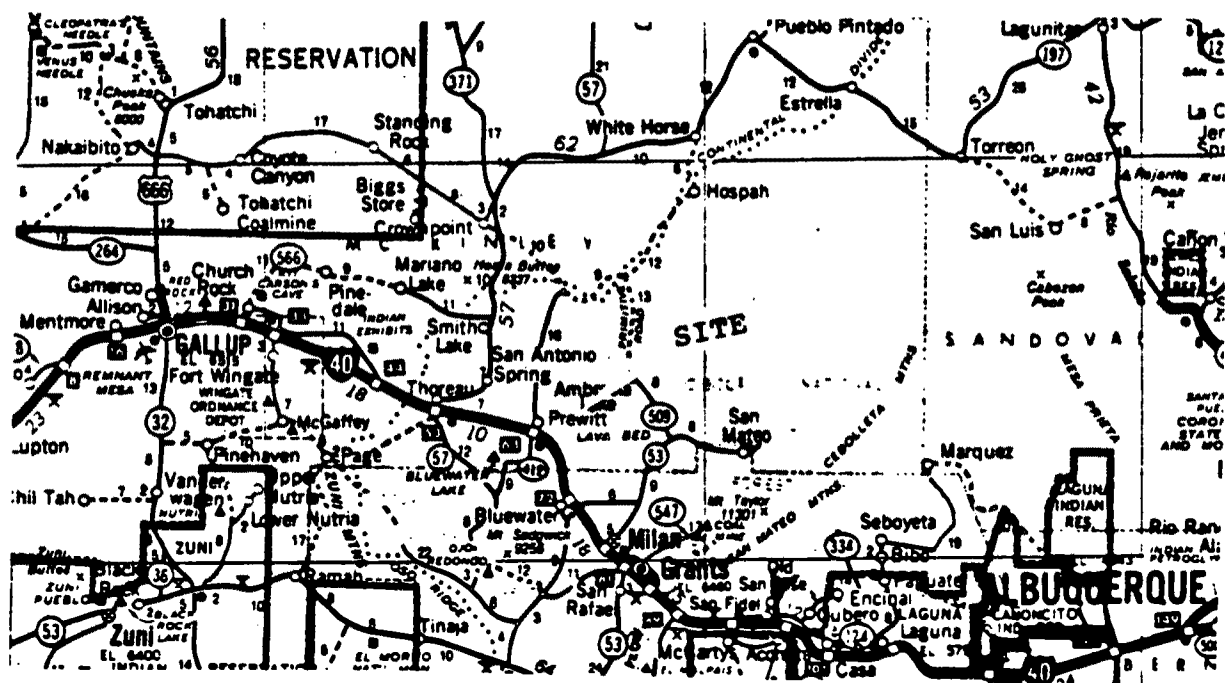


FIGURE # 1 ; REPRINTED BY PERMISSION

NAVAJO SUPERFUND OFFICE

NAVAJO-BROWN VANDEV-
ER URANIUM MINE

JUNE, '90

P. MOLLOY

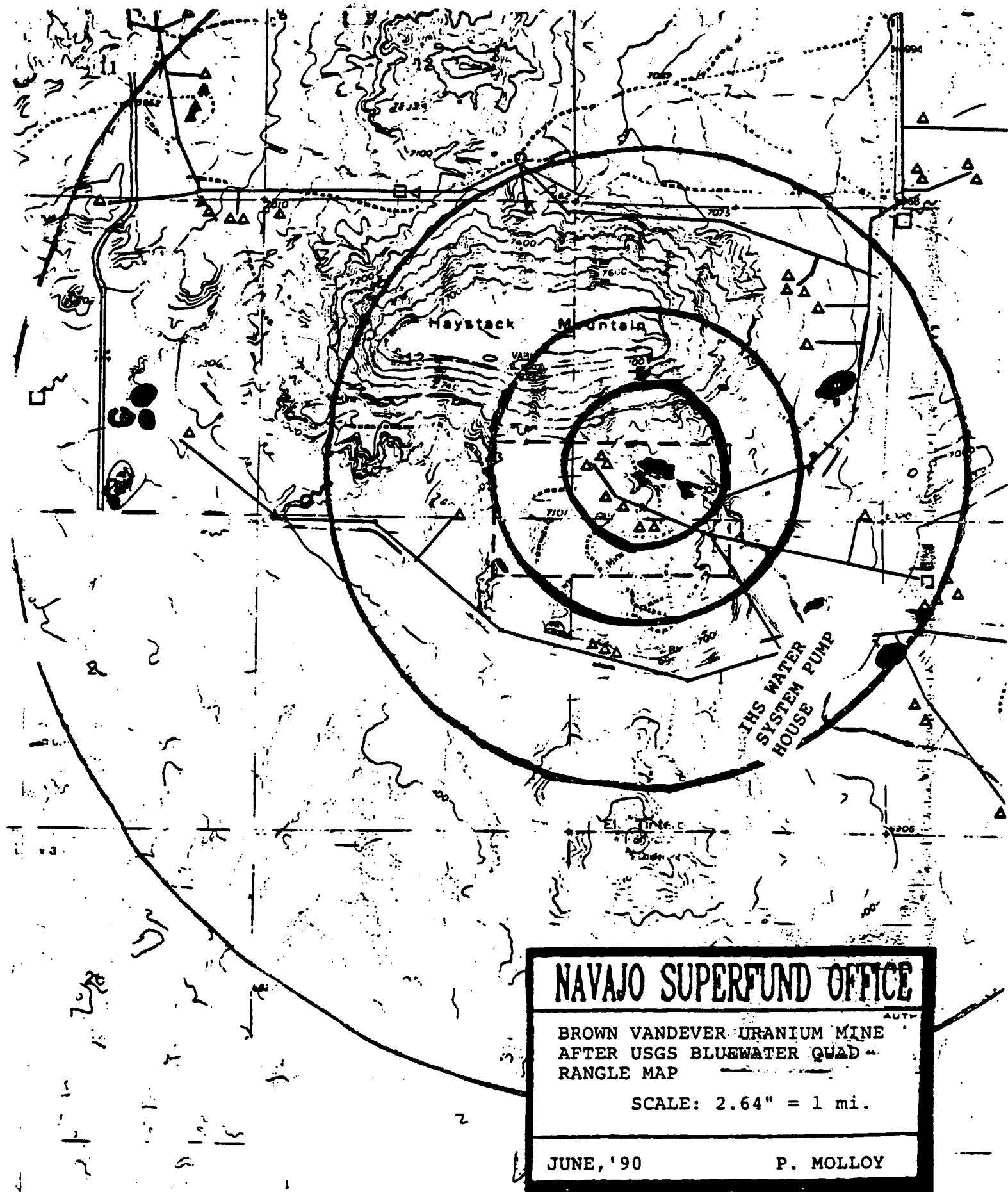
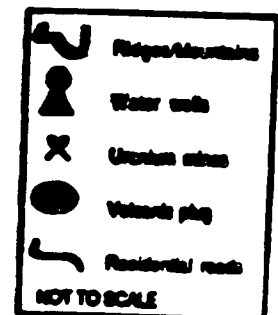
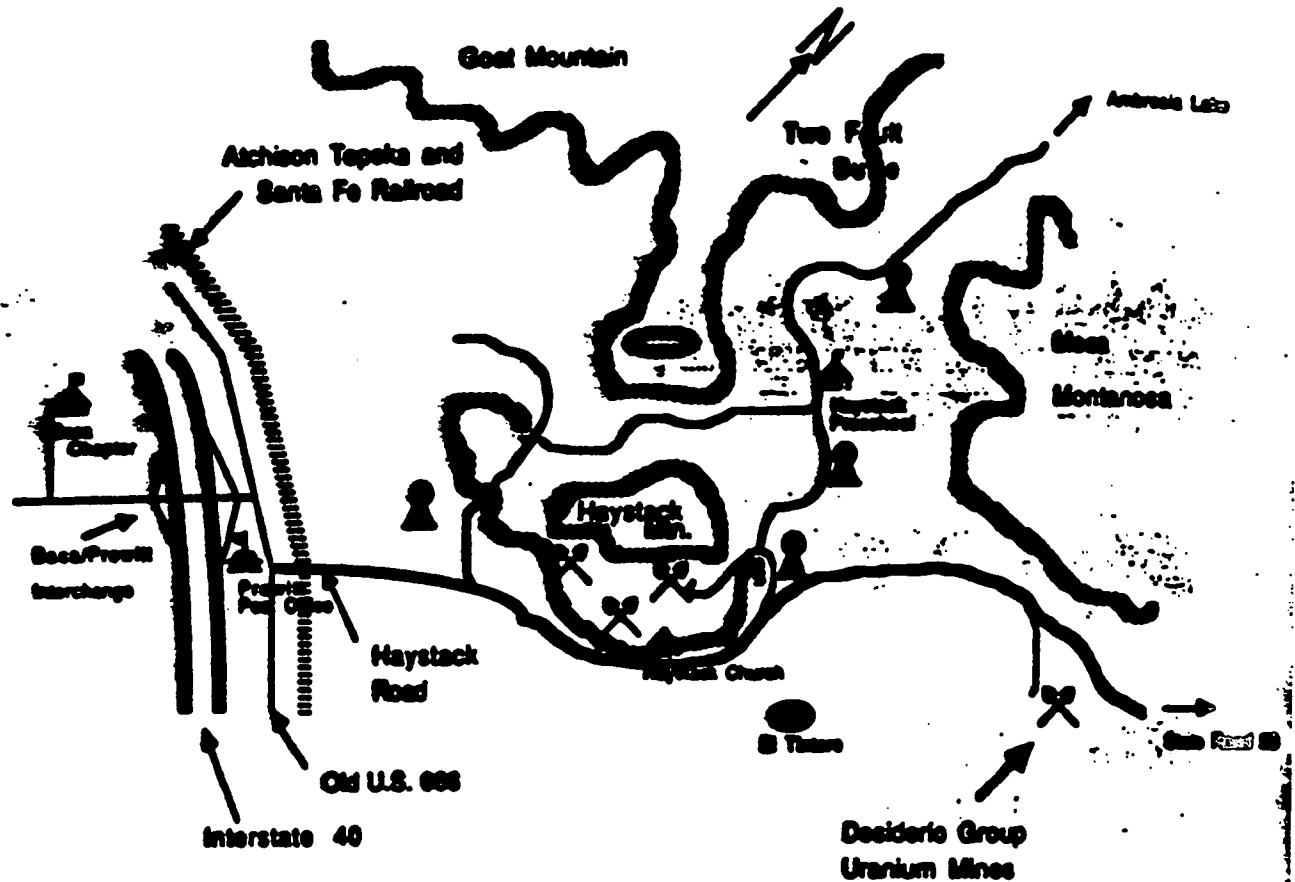


Figure 2. Brown-Vandever Mine Site



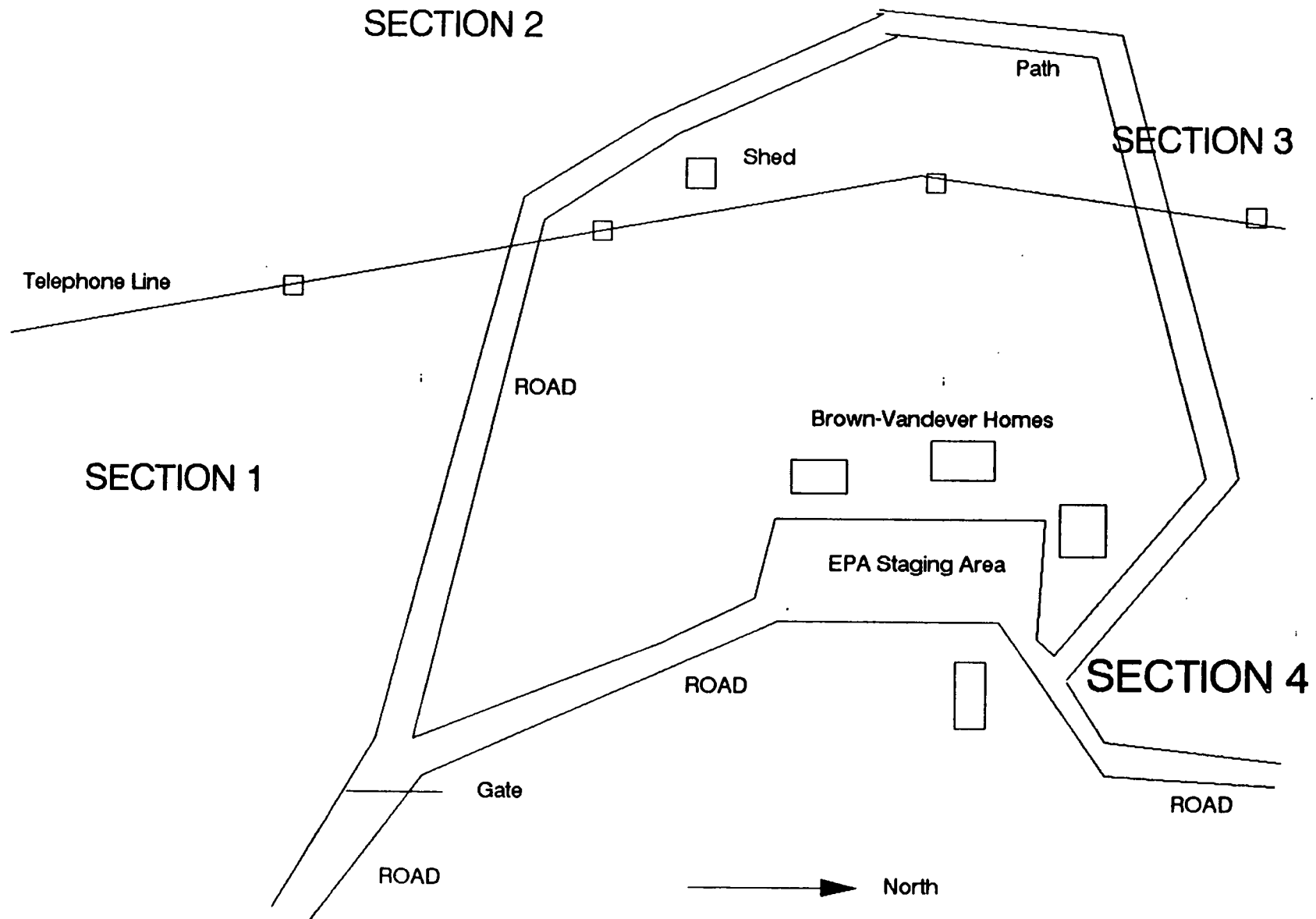
NAVAJO SUPERFUND OFFICE
DESIDERIO GROUP MINES
 Site location

Figure 3. Desiderio Mine Site

S. EDISON JUNE '90

Figure 3

SAMPLING SECTION LOCATIONS, BROWN-VANDEVER MINE SITE



NOT TO SCALE

EPA SURVEY, NOVEMBER 1990

Figure 4. Section Location Map

SAMPLE LOCATIONS, BROWN-VANDEVER MINE SITE SECTION 1

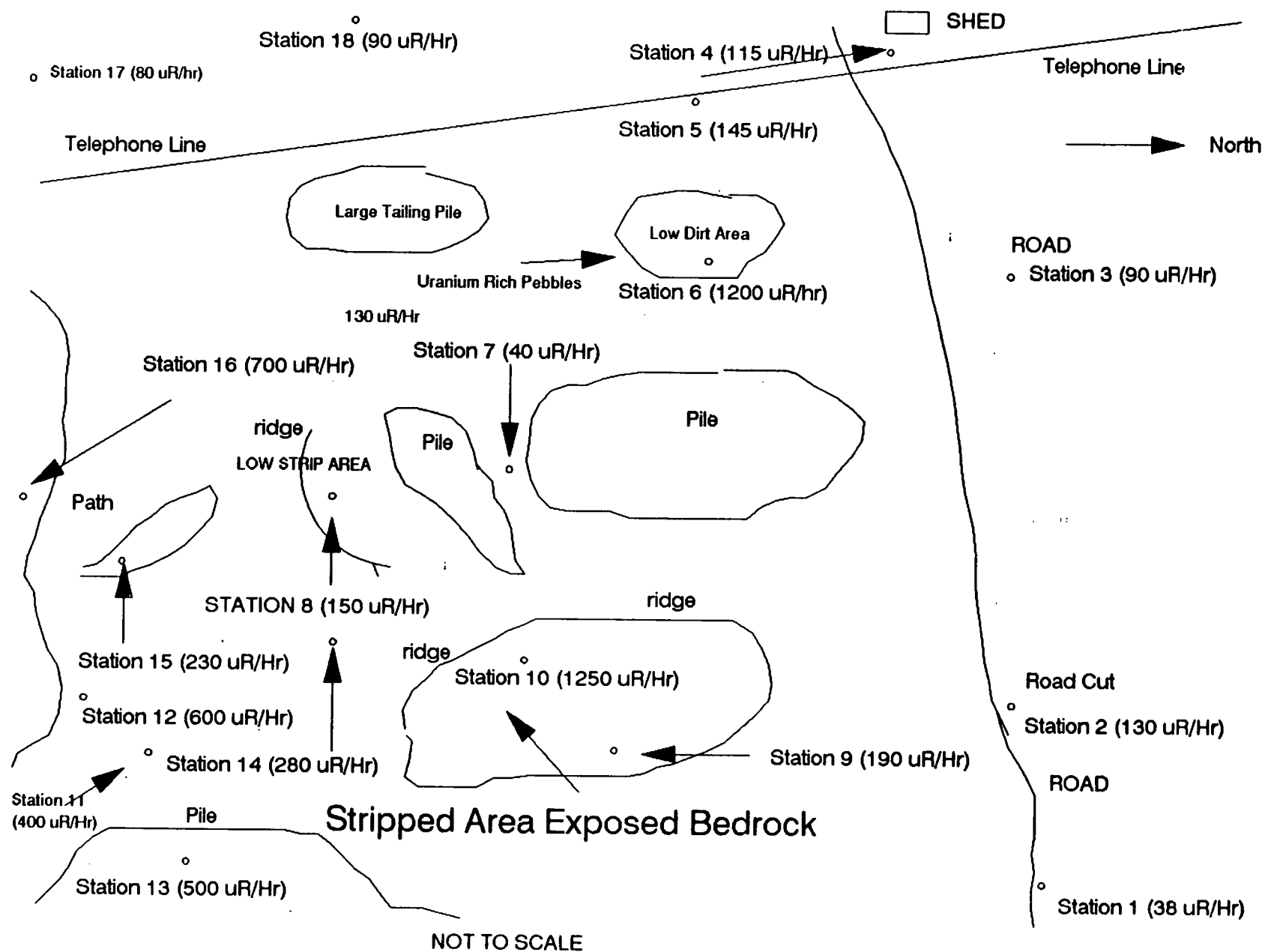


Figure 5. Section 1 B-V.

SAMPLE LOCATIONS, BROWN-VANDEVER MINE SITE

SECTION 2

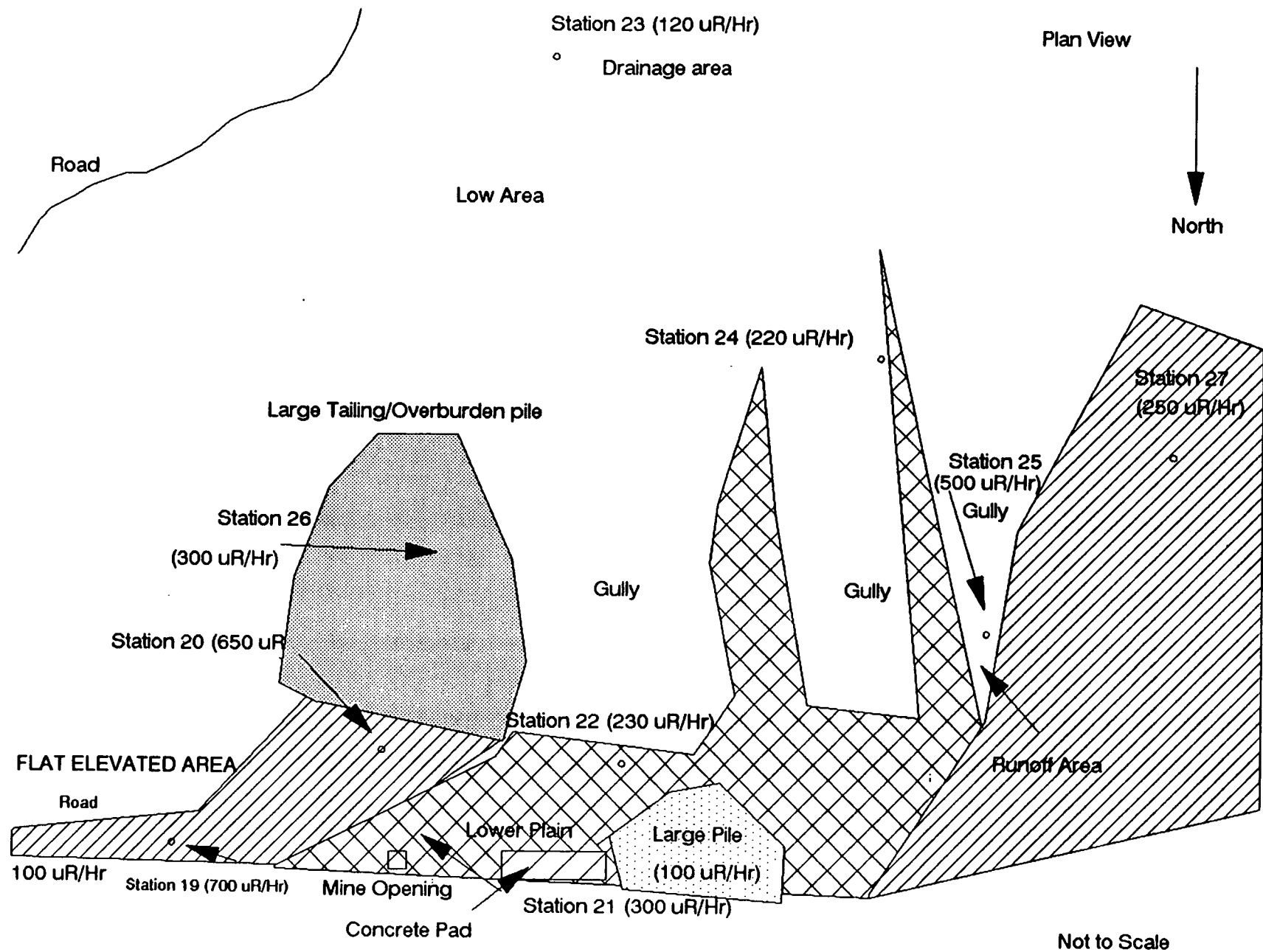


Figure 6. Section 2 B-V.

SAMPLING STATIONS, BROWN-VANDEVER MINE SITE SECTION 3

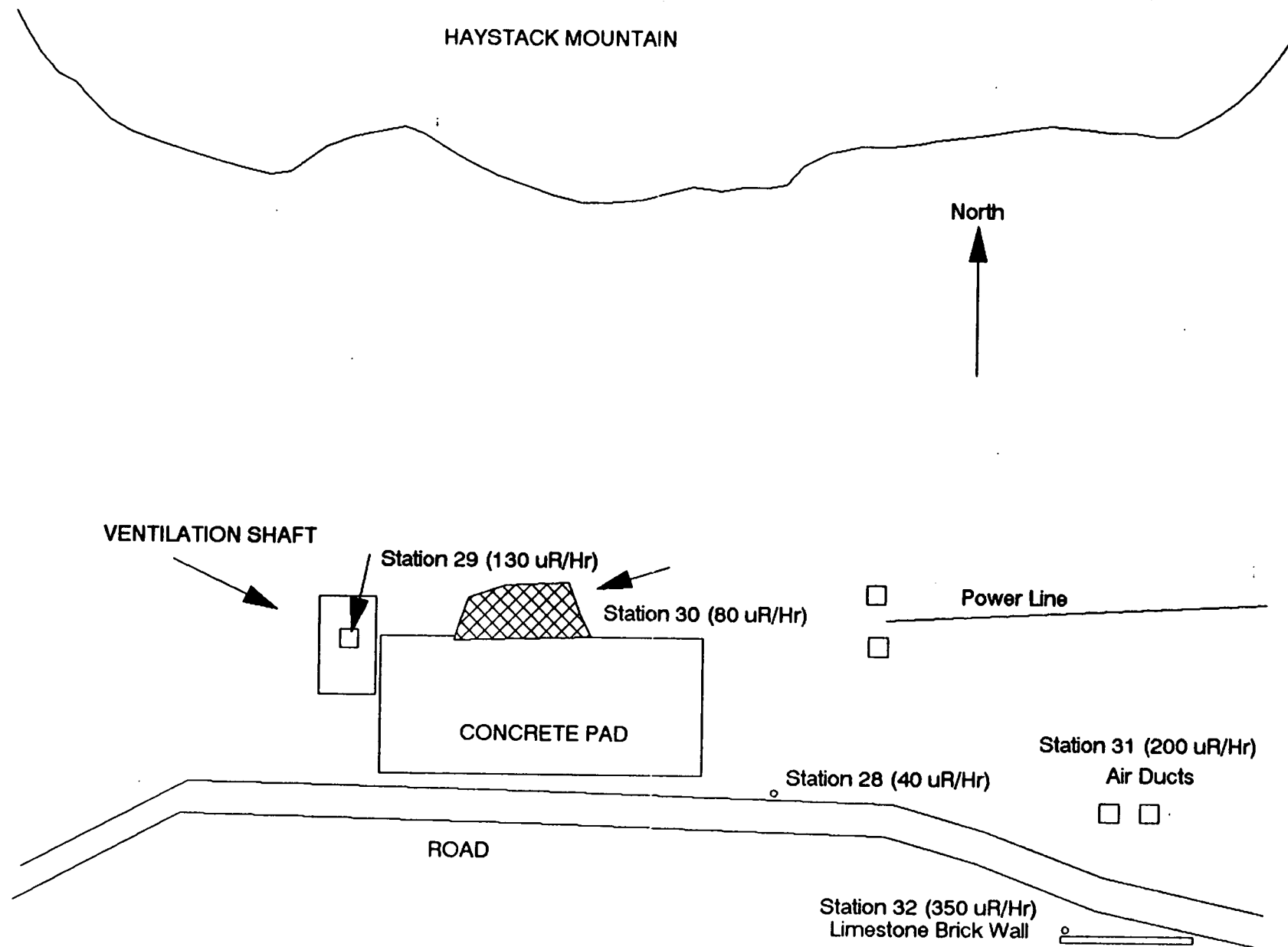
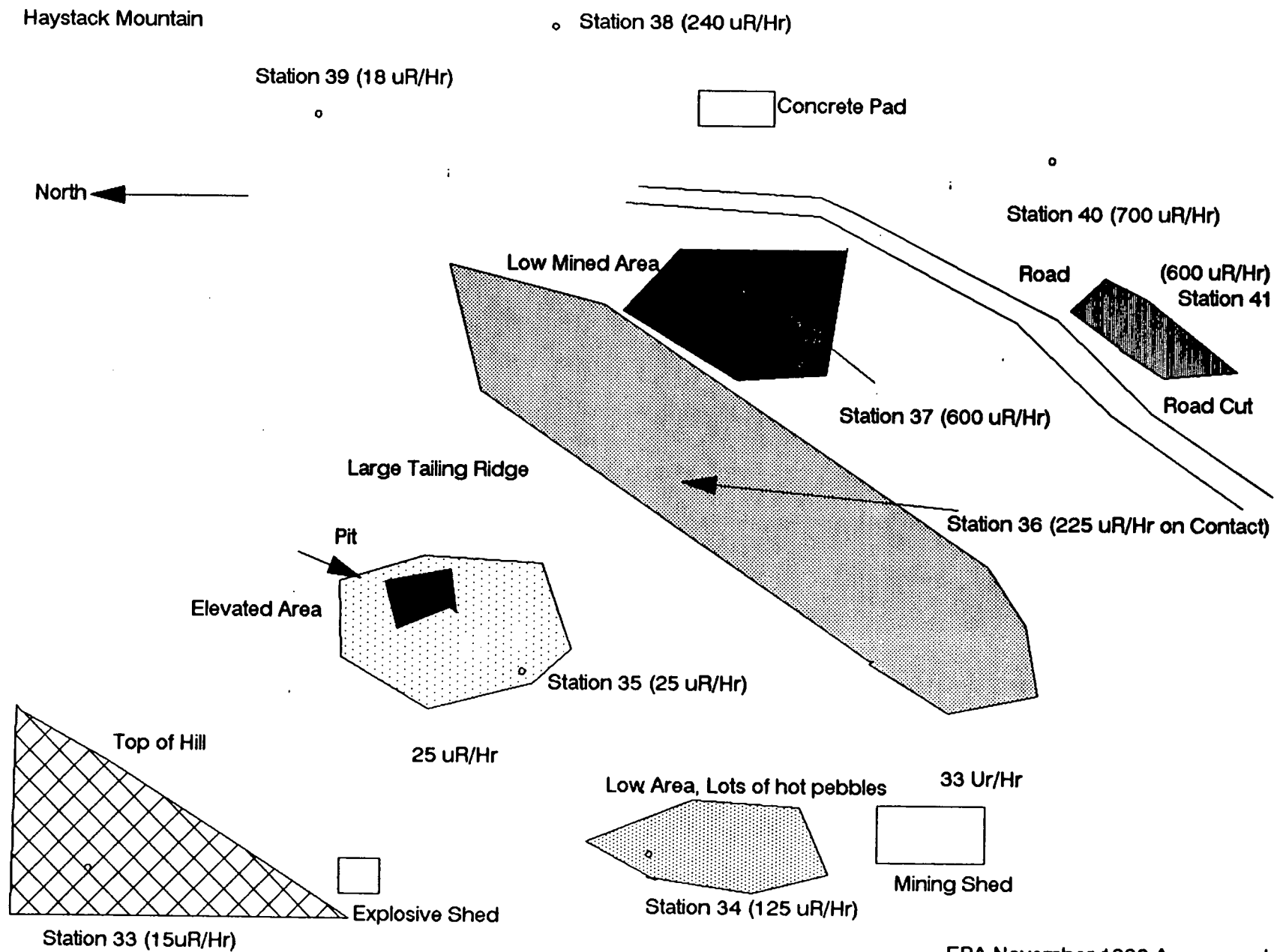


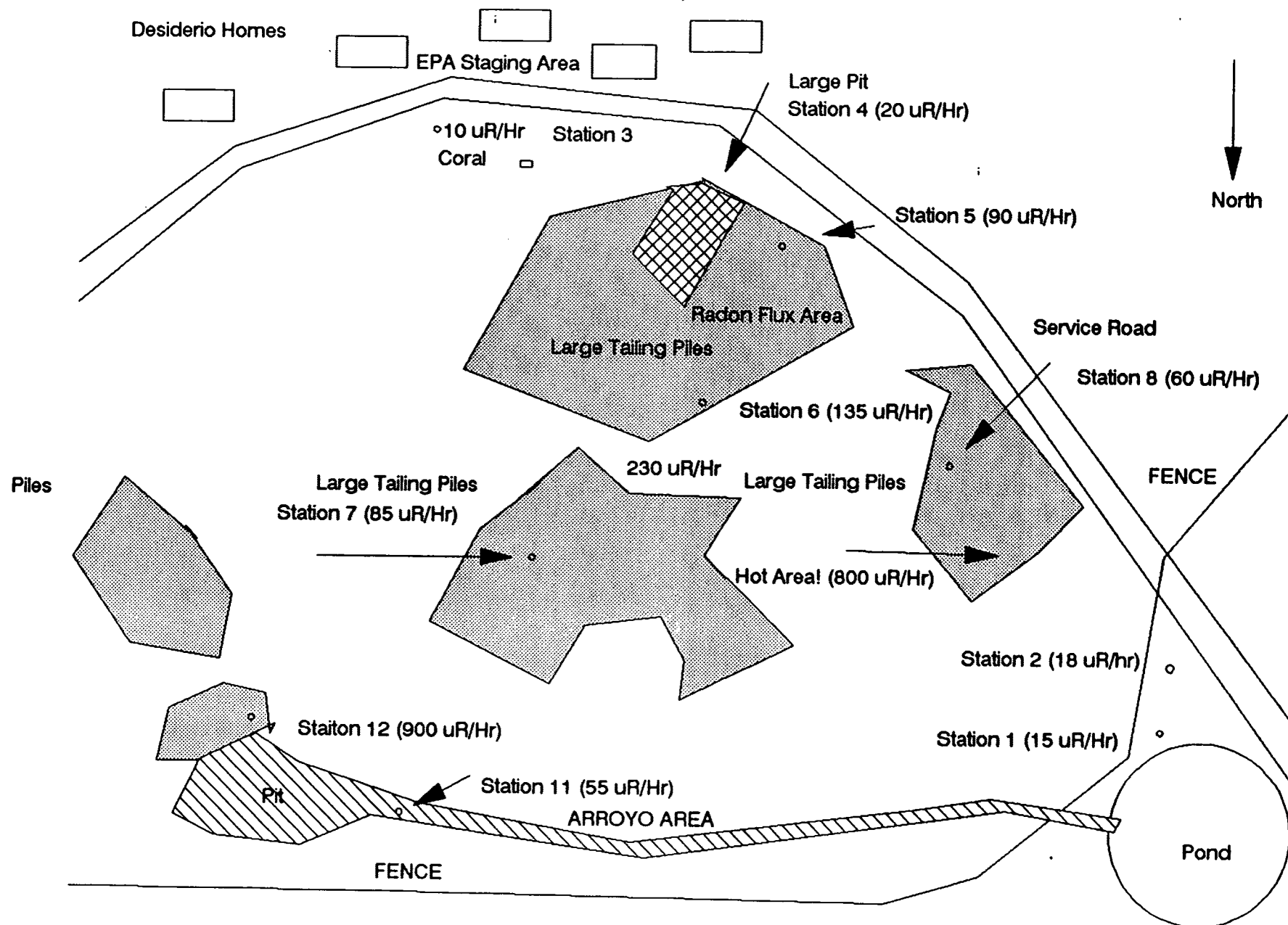
Figure 7. Section 3 B-V.

SAMPLING STATIONS, BROWN-VANDEVER MINE SITE SECTION 4



EPA November 1990 Assessment
Figure 8. Section 4 B-V.

SAMPLING STATIONS, DESIDERIO MINE SITE



EPA Assessment November 1990
Figure 9. Desiderio Mine Site.



SCIENTIFIC ANALYSIS, INC.

November 30, 1990

Ms. Mary Sue Philp
Ecology & Environment
160 Spear St.
San Francisco, CA 94105

Subject: Results of Radon Flux Testing
Navajo Uranium Mine Sites
New Mexico

Dear Ms. Philp:

Scientific Analysis, Inc, is pleased to provide you with the results of 50 radon flux measurements performed on November 15-16, 1990 on three Navajo uranium mine sites using the 4" charcoal canister device (SAACC). While the SAACC procedure is not an EPA approved method, side by side measurements using the SAACC and the EPA approved procedure (LAACC) demonstrate comparable results when respective arithmetic means are computed and compared with each other.

The arithmetic mean radon flux levels were 51.4, 67.0, and 47.7 pCi/m²-s, respectively for stations 5, 6, and 7. For comparison purposes, the 40 CFR Part 61 standard for operating uranium mill tailings piles limits radon emissions to 20 pCi/m²-s.

Individual flux results are presented in the attached Tables Tx where the prefix NU5 refers to Navajo Uranium Station 5, NU6 refers to Navajo Uranium Station 6, and NU7 refers to Navajo Uranium Station 7. Each table is divided into subparts (v) valid test results, (d) duplicate test results to demonstrate counting precision, and (b) "blank" results to check internal quality control. Based on counting results, measurements identified as NU5-20404, NU6-20420, and NU7-20433 are most likely blanks (i.e. unexposed SAACC).

Table QA outlines the quality assurance results. Sampling conditions such as ambient temperature and rainfall are unknown to SAI but are assumed to be within the limits prescribed in the SAACC procedure. In addition, a copy of the sample chain of custody form is included for your files.

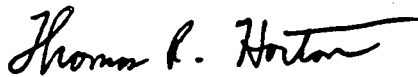
If you have any questions regarding these results and this letter report, please do not hesitate to call me. All data and reports

Ms. Mary Sue Philp
November 30, 1990
Page 2

will be treated as confidential and will not be released without
your written approval.

Sincerely,

SCIENTIFIC ANALYSIS, INC.



Thomas R. Horton
Radiation Consultant

TH/rlr

attach: Table (4)

Table QA**Quality Assurance Results**

<u>Mine Stations</u>	<u>% Completeness</u>	<u>Counting % Precision</u>	<u>Blank (Blind) Identification</u>
Overall	100	0.2	*

*All blanks (blinds) were presumably found and calculated to have an equivalent flux of zero.



U.S. EPA LISTED
RADON LABORATORY

SUMMARY OF RADON FLUX COMPUTATIONS
TABLE Tv. VALID TEST RESULTS FOR TOP OF STACK
Scientific Analysis, Inc.; Montgomery, Alabama 36117

11/27/90

Detector	---- On Stack -----	--- Off Stack ----	-- Count Begun ---	Counter Eff.	Gross Cnts	Background	Flux
NU5-20384	11/15/90 11:38 am	11/16/90 10:17 am	11/20/90 09:14 am	0.1659	56136	616	52.9
NU5-20385	11/15/90 11:40 am	11/16/90 10:17 am	11/20/90 09:26 am	0.1659	65891	616	62.3
NU5-20386	11/15/90 11:32 am	11/16/90 10:21 am	11/20/90 09:46 am	0.1659	37381	616	34.9
NU5-20387	11/15/90 11:30 am	11/16/90 10:18 am	11/20/90 09:58 am	0.1659	38564	616	36.1
NU5-20388	11/15/90 11:34 am	11/16/90 10:19 am	11/20/90 10:09 am	0.1659	41146	616	38.7
NU5-20389	11/15/90 11:37 am	11/16/90 10:18 am	11/20/90 10:20 am	0.1659	50799	616	48.1
NU5-20390	11/15/90 11:42 am	11/16/90 10:15 am	11/20/90 10:31 am	0.1659	41825	616	39.8
NU5-20391	11/15/90 11:44 am	11/16/90 10:16 am	11/20/90 10:42 am	0.1659	37511	616	35.7
NU5-20392	11/15/90 11:31 am	11/16/90 10:18 am	11/20/90 10:53 am	0.1659	72031	616	68.5
NU5-20393	11/15/90 11:30 am	11/16/90 10:21 am	11/20/90 11:04 am	0.1659	73480	616	69.7
NU5-20394	11/15/90 11:27 am	11/16/90 10:20 am	11/20/90 11:18 am	0.1659	67716	616	64.3
NU5-20395	11/15/90 11:23 am	11/16/90 10:20 am	11/20/90 11:31 am	0.1659	41909	616	39.5
NU5-20396	11/15/90 11:45 am	11/16/90 10:21 am	11/20/90 11:50 am	0.1659	133063	616	129
NU5-20397	11/15/90 11:44 am	11/16/90 10:22 am	11/20/90 12:01 pm	0.1659	124722	616	121
NU5-20398	11/15/90 11:40 am	11/16/90 10:21 am	11/20/90 12:13 pm	0.1659	26268	616	24.9
NU5-20399	11/15/90 11:41 am	11/16/90 10:21 am	11/20/90 12:26 pm	0.1659	70727	616	68.3
NU5-20400	11/15/90 11:48 am	11/16/90 10:13 am	11/20/90 12:39 pm	0.1659	21932	616	21.0
NU5-20401	11/15/90 11:45 am	11/16/90 10:17 am	11/20/90 12:56 pm	0.1659	27380	616	26.3
NU5-20402	11/15/90 11:51 am	11/16/90 10:13 am	11/20/90 01:06 pm	0.1659	19879	616	19.1
NU5-20403	11/15/90 11:48 am	11/16/90 10:23 am	11/20/90 01:18 pm	0.1659	28771	616	27.7

NOTE: All times are local stack times; Counting time is 10 minutes; Flux is given in pCi/Sec-Sq M

NOTE: Number of Flux Measurements = 20; Average flux = 51.4


SCIENTIFIC ANALYSIS, INC.
**U.S. EPA LISTED
RADON LABORATORY**

**SUMMARY OF RADON FLUX COMPUTATIONS
TABLE Td. DUPLICATE TEST RESULTS FOR TOP OF STACK
Scientific Analysis, Inc.; Montgomery, Alabama 36117**

11/27/90

Detector	---- On Stack -----	--- Off Stack ----	-- Count Begun ---	Counter Eff.	Gross Cnts	Background	Flux
NU5-20390	11/15/90 11:42 am	11/16/90 10:15 am	11/21/90 11:40 am	0.1647	34465	570	39.9
NU5-20399	11/15/90 11:41 am	11/16/90 10:21 am	11/21/90 11:51 am	0.1647	59115	570	68.6

NOTE: All times are local stack times; Counting time is 10 minutes; Flux is given in pCi/Sec-Sq M

NOTE: Number of Flux Measurements = 2; Average flux = 54.3


SCIENTIFIC ANALYSIS, INC.
**U.S. EPA LISTED
RADON LABORATORY**

SUMMARY OF RADON FLUX COMPUTATIONS
TABLE Tb. BLANK TEST RESULTS FOR TOP OF STACK
 Scientific Analysis, Inc.; Montgomery, Alabama 36117

11/27/90

Detector	---- On Stack -----	--- Off Stack ----	-- Count Begun ---	Counter Eff.	Gross Cnts	Background	Flux
NU5-20404	11/15/90 11:50 am	11/16/90 10:19 am	11/20/90 01:30 pm	0.1659	627	616	0.0

NOTE: All times are local stack times; Counting time is 10 minutes; Flux is given in pCi/Sec-Sq M

NOTE: Number of Flux Measurements = 1; Average flux = 0.0


SCIENTIFIC ANALYSIS, INC.
**U.S. EPA LISTED
RADON LABORATORY**

SUMMARY OF RADON FLUX COMPUTATIONS
TABLE IV. VALID TEST RESULTS FOR TOP OF STACK
 Scientific Analysis, Inc.; Montgomery, Alabama 36117

11/27/90

Detector	---- On Stack -----	--- Off Stack ----	-- Count Begun ---	Counter Rff.	Gross Cnts	Background	Flux
NU6-20405	11/15/90 12:05 pm	11/16/90 10:23 am	11/20/90 01:41 pm	0.1659	18532	616	17.9
NU6-20406	11/15/90 12:03 pm	11/16/90 10:23 am	11/20/90 01:52 pm	0.1659	65963	616	65.2
NU6-20407	11/15/90 12:00 pm	11/16/90 10:23 am	11/20/90 02:03 pm	0.1659	88587	616	87.7
NU6-20408	11/15/90 12:01 pm	11/16/90 10:25 am	11/20/90 02:14 pm	0.1659	58818	616	58.1
NU6-20409	11/15/90 12:07 pm	11/16/90 10:27 am	11/20/90 02:25 pm	0.1659	45538	616	45.0
NU6-20410	11/15/90 12:06 pm	11/16/90 10:28 am	11/20/90 09:03 am	0.1638	43613	618	41.8
NU6-20411	11/15/90 12:02 pm	11/16/90 10:26 am	11/20/90 09:14 am	0.1638	84389	618	81.5
NU6-20412	11/15/90 12:04 pm	11/16/90 10:29 am	11/20/90 09:26 am	0.1638	62770	618	60.5
NU6-20413	11/15/90 11:59 am	11/16/90 10:30 am	11/20/90 09:46 am	0.1638	46518	618	44.6
NU6-20414	11/15/90 12:07 pm	11/16/90 10:31 am	11/20/90 09:58 am	0.1638	46848	618	45.2
NU6-20415	11/15/90 12:10 pm	11/16/90 10:28 am	11/20/90 10:09 am	0.1638	57169	618	55.6
NU6-20416	11/15/90 11:55 am	11/16/90 10:25 am	11/20/90 10:20 am	0.1638	57660	618	55.7
NU6-20417	11/15/90 11:58 am	11/16/90 10:25 am	11/20/90 10:31 am	0.1638	146693	618	143
NU6-20418	11/15/90 11:57 am	11/16/90 10:25 am	11/20/90 10:42 am	0.1638	124072	618	121
NU6-20419	11/15/90 11:53 am	11/16/90 10:25 am	11/20/90 10:53 am	0.1638	84129	618	81.8

NOTE: All times are local stack times; Counting time is 10 minutes; Flux is given in pCi/Sec-Sq M
 NOTE: Number of Flux Measurements = 15; Average flux = 67.0


SCIENTIFIC ANALYSIS, INC.
**U.S. EPA LISTED
RADON LABORATORY**

SUMMARY OF RADON FLUX COMPUTATIONS
TABLE Id. DUPLICATE TEST RESULTS FOR TOP OF STACK
 Scientific Analysis, Inc.; Montgomery, Alabama 36117

11/27/90

Detector	---- On Stack -----	--- Off Stack ----	-- Count Begun ---	Counter Eff.	Gross Cnts	Background	Flux
NU6-20410	11/15/90 12:06 pm	11/16/90 10:28 am	11/21/90 11:40 am	0.1642	35937	634	41.9
NU6-20420	11/15/90 11:50 am	11/16/90 10:25 am	11/21/90 11:51 am	0.1642	625	634	0.0

NOTE: All times are local stack times; Counting time is /O minutes; Flux is given in pCi/Sec-Sq M
 NOTE: Number of Flux Measurements = 2; Average flux = 20.9


SCIENTIFIC ANALYSIS, INC.
**U.S. EPA LISTED
RADON LABORATORY**

SUMMARY OF RADON FLUX COMPUTATIONS
TABLE Tb. BLANK TEST RESULTS FOR TOP OF STACK
 Scientific Analysis, Inc.; Montgomery, Alabama 36117

11/27/90

Detector	---- On Stack -----	--- Off Stack ----	-- Count Begun ---	Counter Eff.	Gross Cnts	Background	Flux
NU6-20420	11/15/90 11:50 am	11/16/90 10:25 am	11/20/90 11:04 am	0.1638	640	618	0.0

NOTE: All times are local stack times; Counting time is 0 minutes; Flux is given in pCi/Sec-Sq M

NOTE: Number of Flux Measurements = 1; Average flux = 0.0


SCIENTIFIC ANALYSIS, INC.
**U.S. EPA LISTED
RADON LABORATORY**

SUMMARY OF RADON FLUX COMPUTATIONS
TABLE Tv. VALID TEST RESULTS FOR TOP OF STACK
 Scientific Analysis, Inc.; Montgomery, Alabama 36117

11/27/90

Detector	---- On Stack -----	--- Off Stack ----	-- Count Begun ---	Counter Eff.	Gross Cnts	Background	Flux
HU7-20421	11/15/90 12:14 pm	11/16/90 10:29 am	11/20/90 11:18 am	0.1638	40588	618	39.7
HU7-20422	11/15/90 12:16 pm	11/16/90 10:29 am	11/20/90 11:31 am	0.1638	67549	618	66.7
HU7-20423	11/15/90 12:18 pm	11/16/90 10:30 am	11/20/90 11:50 am	0.1638	53832	618	53.2
HU7-20424	11/15/90 12:22 pm	11/16/90 10:30 am	11/20/90 12:01 pm	0.1638	29053	618	28.6
HU7-20425	11/15/90 12:22 pm	11/16/90 10:30 am	11/20/90 12:13 pm	0.1638	37118	618	36.7
HU7-20426	11/15/90 12:19 pm	11/16/90 10:30 am	11/20/90 12:26 pm	0.1638	37697	618	37.3
HU7-20427	11/15/90 12:15 pm	11/16/90 10:30 am	11/20/90 12:39 pm	0.1638	42691	618	42.2
HU7-20428	11/15/90 12:18 pm	11/16/90 10:33 am	11/20/90 12:56 pm	0.1638	55381	618	55.1
HU7-20429	11/15/90 12:20 pm	11/16/90 10:34 am	11/20/90 01:06 pm	0.1638	39554	618	39.2
HU7-20430	11/15/90 12:12 pm	11/16/90 10:35 am	11/20/90 01:18 pm	0.1638	41457	618	41.0
HU7-20431	11/15/90 12:24 pm	11/16/90 10:34 am	11/20/90 01:30 pm	0.1638	46276	618	46.3
HU7-20432	11/15/90 12:28 pm	11/16/90 10:32 am	11/20/90 01:41 pm	0.1638	84987	618	85.9

NOTE: All times are local stack times; Counting time is 10 minutes; Flux is given in pCi/Sec-Sq M

NOTE: Number of Flux Measurements = 12; Average flux = 47.7


SCIENTIFIC ANALYSIS, INC.
**U.S. EPA LISTED
RADON LABORATORY**

SUMMARY OF RADON FLUX COMPUTATIONS
TABLE 1d. DUPLICATE TEST RESULTS FOR TOP OF STACK
 Scientific Analysis, Inc.; Montgomery, Alabama 36117

11/27/90

Detector	---- On Stack -----	--- Off Stack ----	-- Count Begun ---	Counter Eff.	Gross Cnts	Background	Flux
NU7-20430	11/15/90 12:12 pm	11/16/90 10:35 am	11/21/90 12:02 pm	0.1642	35074	634	40.9

NOTE: All times are local stack times; Counting time is /0minutes; Flux is given in pCi/Sec-Sq M

NOTE: Number of Flux Measurements = 1; Average flux = 40.9


SCIENTIFIC ANALYSIS, INC.
**U.S. EPA LISTED
RADON LABORATORY**

SUMMARY OF RADON FLUX COMPUTATIONS
TABLE Tb. BLANK TEST RESULTS FOR TOP OF STACK
 Scientific Analysis, Inc.; Montgomery, Alabama 36117

11/27/90

Detector	---- On Stack -----	--- Off Stack ----	-- Count Begun ---	Counter Eff.	Gross Cnts	Background	Flux
NU7-20433	11/15/90 12:15 pm	11/16/90 10:30 am	11/20/90 01:52 pm	0.1638	622	618	0.0

NOTE: All times are local stack times; Counting time is 0 minutes; Flux is given in pCi/Sec-Sq M

NOTE: Number of Flux Measurements = 1; Average flux = 0.0

SCIENTIFIC ANALYSIS, INC.

CHAIN OF CUSTODY RECORD

Radon Flux Testing

Job Name:	<u>Ecology & Environment - Navajo Uranium mine Site</u>
Samplers (Name and Signature):	<u>Mary Sue Philp</u> <u>Beverly Pester</u>
Sample Locations/Sample ID Numbers (Collector Numbers):	<u>#20384 to #20433</u>
Sample Type:	<u>Exposed Charcoal in Plastic Container</u>
Total Number of Samples:	<u>50</u>
Collection Date:	<u>11/15/90 to 11/16/90</u>

Relinquished By (Name and Signature):	<u>Mary Sue Philp</u> <u>[Signature]</u>
Date/Time:	<u>11/16/90</u>
Received By (Name and Signature):	<u>Faith Ann McWhorter</u> <u>Faith Ann McWhorter</u>
Date/Time:	<u>11-19-90 10:00 am</u>
Relinquished By (Name and Signature):	_____ _____
Date/Time:	_____ _____
Received By (Name and Signature):	_____ _____
Date/Time:	_____ _____

SCIENTIFIC ANALYSIS, INC.

CHAIN OF CUSTODY RECORD

Radon Flux Testing

Job Name:	<u>Ecology & Environment - Navajo Uranium mine Sites</u>
Samplers (Name and Signature):	<u>Mary Sue Philp</u> <u>Beverly Pester</u>
Sample Locations/Sample ID Numbers (Collector Numbers):	<u>#20384 to #20433</u>
Sample Type:	<u>Exposed Charcoal in Plastic Container</u>
Total Number of Samples:	<u>50</u>
Collection Date:	<u>11/15/90 to 11/16/90</u>

Relinquished By (Name and Signature):	<u>Mary Sue Philp</u> <u>Beverly Pester</u>
Date/Time:	<u>11/16/90</u>
Received By (Name and Signature):	<u>Faith Ann McWhorter</u> <u>Faith Ann McWhorter</u>
Date/Time:	<u>11-19-90 10:00 am</u>
Relinquished By (Name and Signature):	_____ _____
Date/Time:	_____ _____
Received By (Name and Signature):	_____ _____
Date/Time:	_____ _____

NA

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RADIATION PROGRAMS - LAS VEGAS FACILITY

* * *

DMR INPUT # 1

NAME: ~~BID~~ House ID = NAV9001
ADDRESS:
CITY:
STATE/ZIP: NV
COMMENTS:

MEASUREMENT TIME AND DATE: 14:22 11-26-90

CANISTER TYPE IS DIFFUSION BARRIER
EXPOSURE START: 13:25 11/15/90
EXPOSURE STOP: 09:15 11/22/90
TOTAL EXPOSURE TIME 163.8333 HOURS
COUNTING TIME 600 SECONDS
ADDITIONAL DECAY TIME 101.1167 HOURS
SYSTEM EFFICIENCY 27 %
WEIGHT OF ABSORBED WATER 0 GRAMS
NET COUNTS PER MINUTE 60.8
CANISTER I.D. NUMBER 804145
CANISTER FILE EPA.CAN

RADON CONCENTRATION = 3.3 pCi/l

* * *

The United States Environmental Protection Agency and the Centers for Disease Control have used a CONTINUOUS EXPOSURE level of 4pCi/l or 0.02 WL as a guidance level at which further testing and/or remedial action are indicated. Consult your testing laboratory for further information.

NA
N

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RADIATION PROGRAMS - LAS VEGAS FACILITY

* * *

DMR INPUT # 2

NAME: ~~CHAMBER~~ House ID = NAV9002
ADDRESS:
CITY:
STATE/ZIP: NV
COMMENTS:

MEASUREMENT TIME AND DATE: 14:22 11-26-90

CANISTER TYPE IS DIFFUSION BARRIER
EXPOSURE START: 15:15 11/15/90
EXPOSURE STOP: 10:20 11/22/90
TOTAL EXPOSURE TIME 163.0833 HOURS
COUNTING TIME 600 SECONDS
ADDITIONAL DECAY TIME 100.0333 HOURS
SYSTEM EFFICIENCY 27 %
WEIGHT OF ABSORBED WATER 0 GRAMS
NET COUNTS PER MINUTE 95832.6
CANISTER I.D. NUMBER 804142
CANISTER FILE EPA.CAN

RADON CONCENTRATION = 5114.6 pCi/l

← near ventilation
shaft of abandoned
mine!!

* * *

The United States Environmental Protection Agency and the Centers for Disease Control have used a CONTINUOUS EXPOSURE level of 4pCi/l or 0.02 WL as a guideline level at which further testing and/or remedial action are indicated. Consult your testing laboratory for further information.

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RADIATION PROGRAMS - LAS VEGAS FACILITY

* * *
DMR INPUT # 3

NAME: ~~CHAMBER~~ House ID = NAV9003
ADDRESS:
CITY:
STATE/ZIP: NV
COMMENTS:

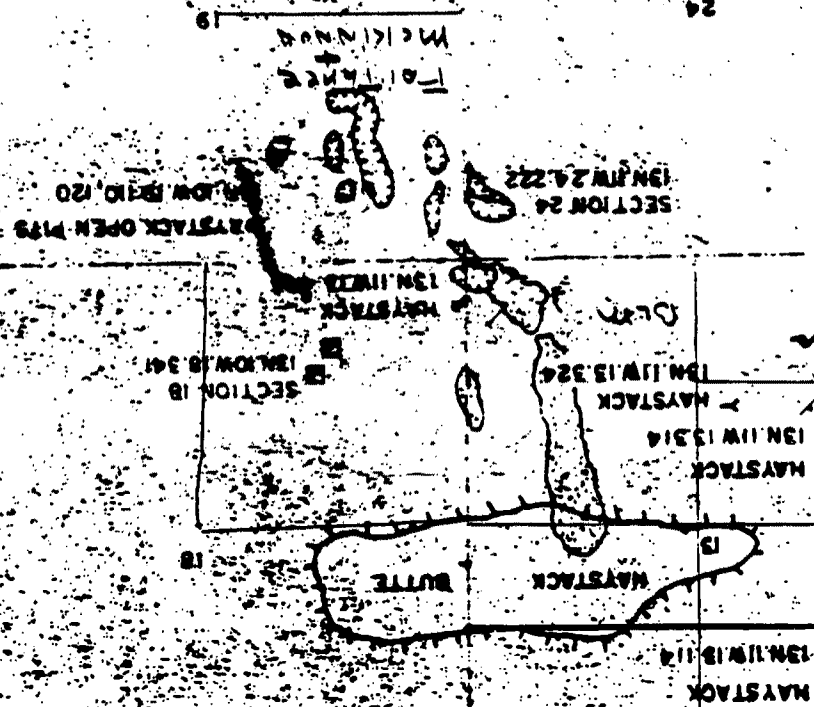
MEASUREMENT TIME AND DATE: 14:22 11-26-90

CANISTER TYPE IS DIFFUSION BARRIER
EXPOSURE START: 04:10 11/15/90
EXPOSURE STOP: 10:05 11/22/90
TOTAL EXPOSURE TIME 173.9167 HOURS
COUNTING TIME 600 SECONDS
ADDITIONAL DECAY TIME 100.2833 HOURS
SYSTEM EFFICIENCY 27 %
WEIGHT OF ABSORBED WATER 0 GRAMS
NET COUNTS PER MINUTE 38
CANISTER I.D. NUMBER 804146
CANISTER FILE EPA.CAN

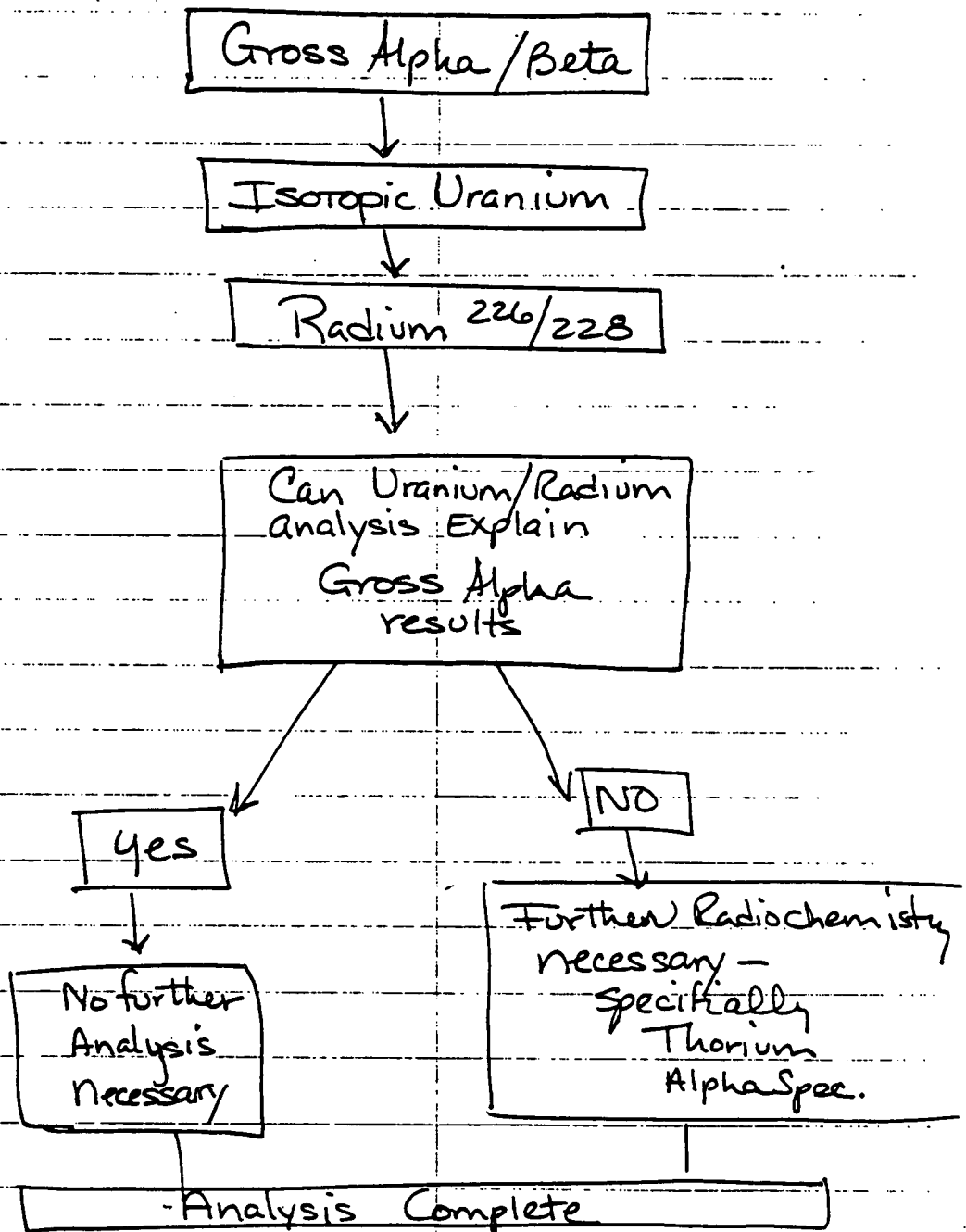
RADON CONCENTRATION = 2.0 pCi/l

* * *

The United States Environmental Protection Agency and the Centers for Disease Control have used a CONTINUOUS EXPOSURE level of 4pCi/l or 0.02 WL as a guidance level at which further testing and/or remedial action are indicated. Consult your testing laboratory for further information.



Analysis Tree for Prewater/Bluewater NM Water Samples



Analysis Generates:
Gross Alpha Activity
Gross Beta Activity
Radium Activity
Uranium Activity
Isotopic Alpha/Beta Act. (if read.)

RADIOANALYTICAL EQUIPMENT

Type	No.	Yr-Bought	
Gross Alpha Counters	47	1984-1990	
40 - Berthold LB-770 (20-2" & 20-1")			
7 - Eberline Sac-4			
Gross Beta Counters **	40	1984-1990	**
40 - Berthold LB-770 (20-2" & 20-1")			
Liquid Scintillation	1	1990	
1 - Packard 1900CA			
Ge Detectors	6	1988-1990	
Canberra - Nuclear Data	1	1990	
Accu Spec/B Data Acquisition/Reduction System			
Alpha Spectroscopy Detectors ***	48	1989-1990	***
Canberra - Nuclear Data	1	1990	
System 100 Data Acquisition/Reduction System			
X-Ray Spectroscopy	2	1986	
Bicron 1" x 0.05" NaI detectors			
Gross Alpha Gas Counters (Rn-222 detectors)	16	1975-1990	*
Eberline Model SAC R5 & MS-2			
Specialized Detectors	7	various	
Total Detectors	167		

General Laboratory Equipment

Ball mills	2
Fume Hoods	13
Centrifuge	9
Canopies	5
Balances	7
Drying Ovens	6
Ashing Furnaces	7
Pressure Filtrators	2
Vacuum Filtrators	8
Hot Plates	13
Heat Lamps	2
Electroplaters	45
Stirrers	34
Burrell Shaker	8

* Used for Ra-226 via Rn-222 da-emanation

** Used for Ra-228 via Ac-228 Beta emissions

*** Used for alpha Spectrometry